SCIENTIFIC AMERICAN

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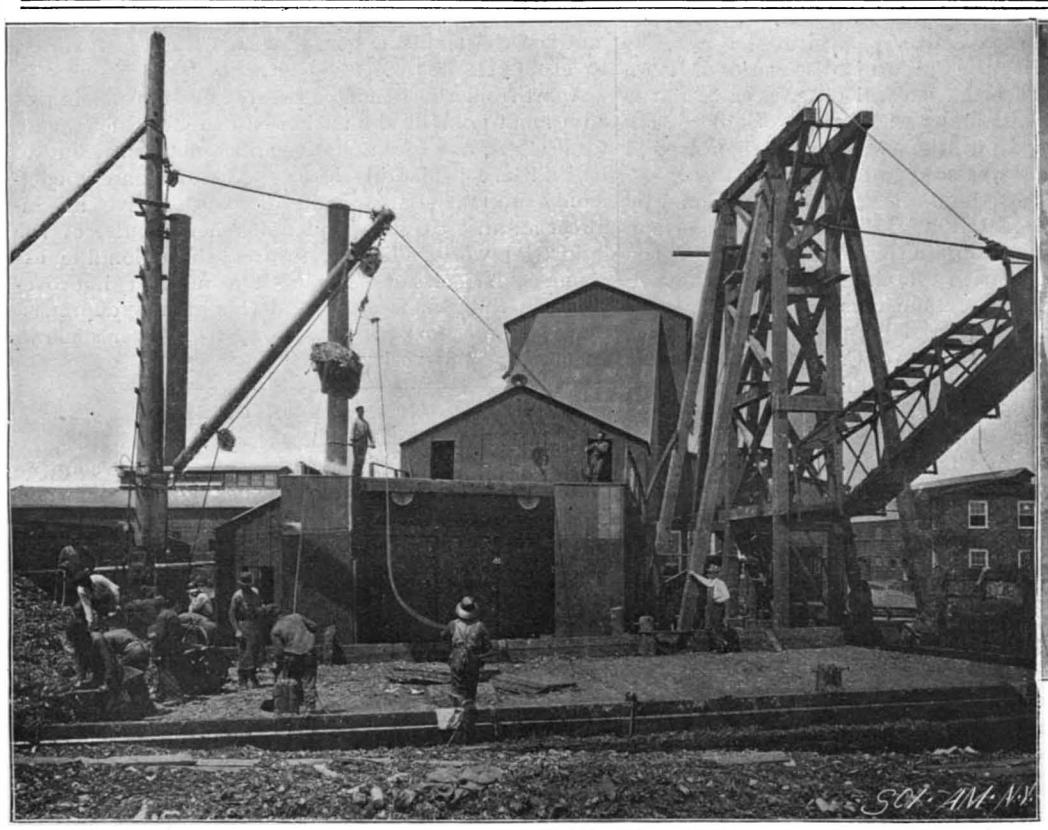

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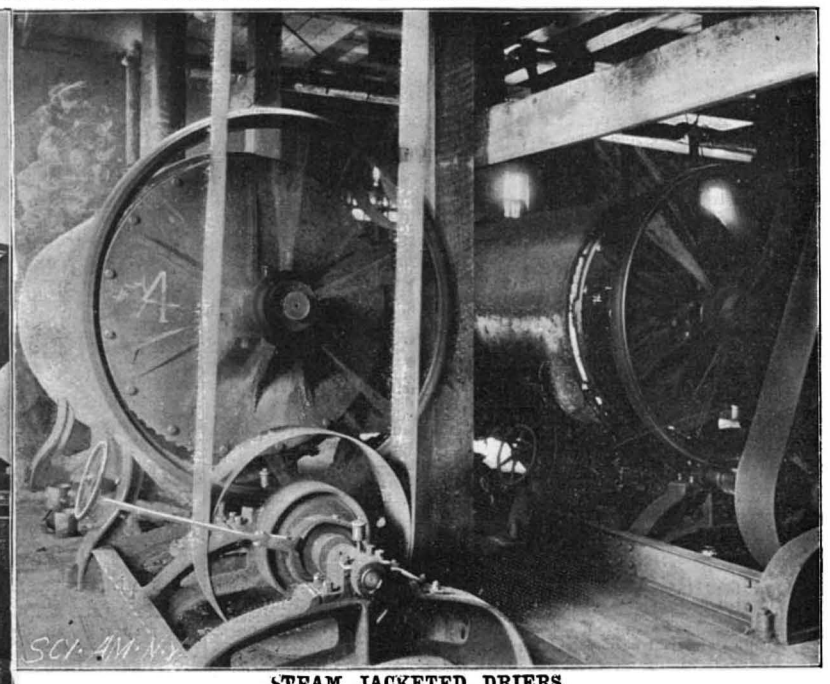

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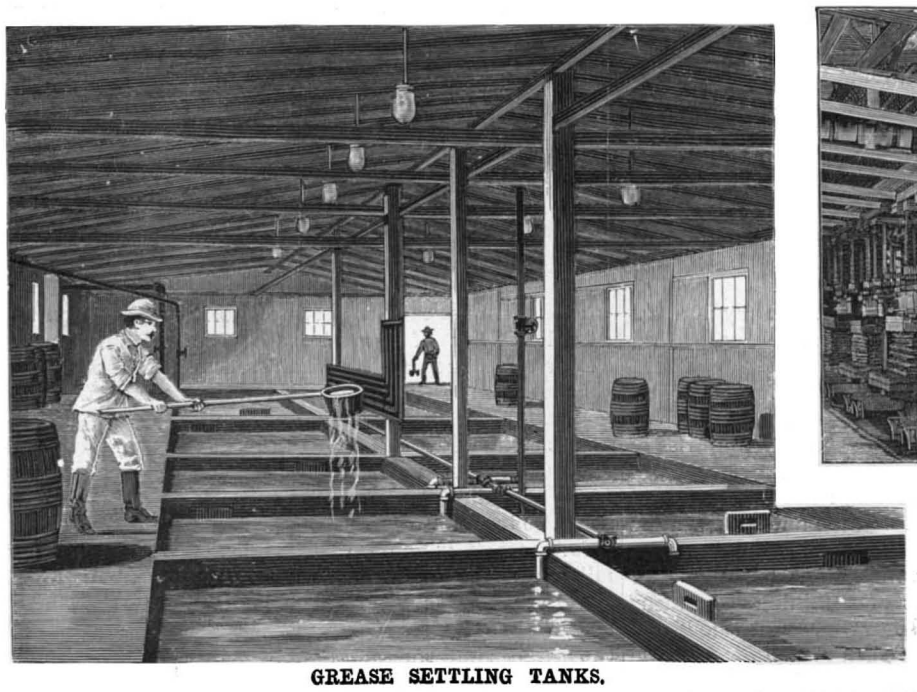

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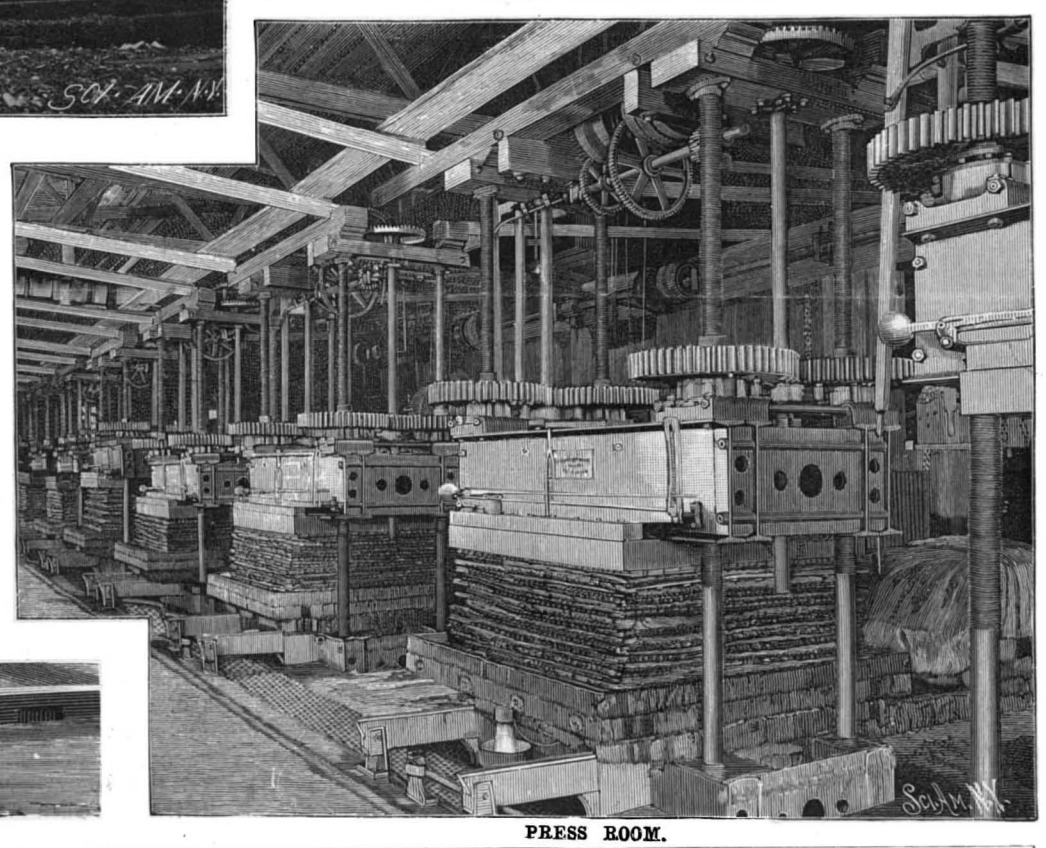

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EXTERIOR OF GARBAGE WORKS.

THE UTILIZATION OF NEW YORK CITY GARBAGE.—[See page 102.]

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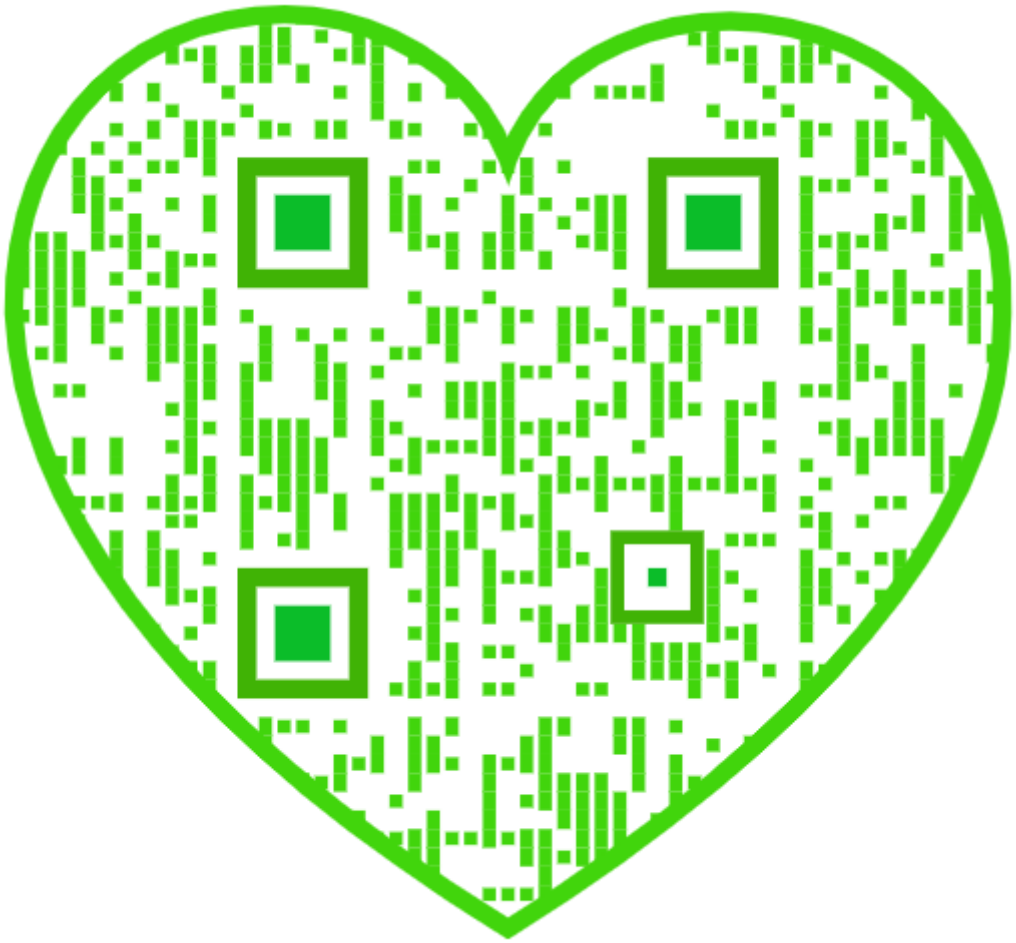

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THE ALASKAN GOLD FIELDS.

The announcement of the return of two steamers from the Alaskan gold fields last month, with a small party of miners on board who carried about a million and a half in gold between them, has gone through the world like an electric shock and bids fair to end in a "gold fever" comparable only to the wild excitement of the California discoveries in 1849. Already the "rush" has begun, and in spite of the warnings of the miners who have just come out of the country, and the detailed account by the press of the inhospitable and inaccessible nature of the placer districts, the symptoms of that wild scramble incident to a gold excitement are more or less manifest throughout the continent.

As compared with the California discoveries of half a century ago, those in Alaska will differ greatly in the nature of the climate under which the work of the miner must be carried out, the one being as rigorous and trying as the other was mild and favorable.

This is a fact that should be carefully considered by every inexperienced but adventurous spirit that may be contemplating a trip to this remote corner of the earth. The fact that in 1849 clerks were able to leave the desk and counter, and business men the snug comforts of home and office, and plunge without hurt to themselves into the hardships of California camp life is no proof that a similar venture may be made in these mining camps of the far North, where the thermometer has a range of one hundred and sixty degrees in the year, and sixty degrees below is a common experience in the winter. Of all the incidents related by returning prospectors, nothing is more significant of the peculiar difficulties of Alaskan mining than the fact that the gravel beds have to be thawed out by building wood fires above them before the material is ready for the miner's pan and the sluice-box.

The Klondike River, in which the rich gravel beds lie, is a minor tributary of the great Yukon River. Although the gold fields are, and probably will be, popularly known as Alaskan, they lie to the east of the boundary line and are therefore in the Canadian Northwest Territory. At present there are two routes by which the district can be reached from Seattle, the nearest American port. The longer and less trying journey is made by ocean steamer to St. Michael at the mouth of the Yukon, and thence by river steamer to Dawson City at the confluence of the Klondike and the Yukon. This route is estimated to be about 4,700 miles long. The cheaper and shorter route, and that taken by most of the miners, is by steamer from Seattle to Juneau, and overland from this point to Circle City. Although this route is less than half the distance of the former, it involves an overland journey of nearly nine hundred miles, in which traveling is difficult and in some places attended with considerable hardship.

As to the placer deposits themselves, they are undoubtedly of extraordinary richness. The fact that miners should come out after a few months' work with from twenty thousand to two hundred thousand in gold proves this beyond a doubt; but just what the extent of the gold field is, and how many other tributaries of the Yukon will show a similar prospect, time alone will tell. This much however is certain: the outside world will only hear of the larger fortunes, and little will be said about the host of unsuccessful adventurers who form the background upon which the alluring bags of gold dust and jars of nuggets of a mining excitement are displayed. Except to the few thousands who locate the richest claims in the first rush of prospectors, the average chances of digging up and washing out a speedy fortune are very slim. It is easy to estimate that of the thousands who will probably go to the Klondike in the spring, but very few will find claims that have not already been staked out. There are probably at this writing some four or five thousand miners on the Yukon, and they will flock, as is the miners' wont, to the new El Dorado. The length of the permissible claim along a stream is five hundred feet, and a simple calculation shows that these men alone could cover five hundred miles of the best claims before the arrival of next season's crowd of adventurers.

Next to those fortunes which are made in the placer mines the most speedy and largest fortunes will be realized by the prospectors who discover the rich quartz deposits from which nature has broken out and washed down the present gravel beds. As yet nothing has been done apparently in the way of quartz prospecting, although it is likely that rich veins exist somewhere within the watershed of these various tributaries of the Yukon. At best placer mining is but introductory to the more extended and enduring quartz mining, and when the latter has once been put fairly under way, we may look for the systematic development of this remote but extremely interesting country.

The present discoveries of gold come as a further vindication of the wisdom which dictated the purchase of Alaska from the Russian government just thirty years ago. Its purchase price was $7,200,000, and it is estimated that the royalties from the fur sealing company, the rich returns of the salmon industry, not to mention the annual output of the great Treadwell gold mine on Douglass Island, the largest mill of its kind in the world, have together paid back the purchase price many times over to the United States. It is stated that there are indications of the existence of coal and the various leading minerals; but at present there is no evidence that the country is capable of producing the necessaries of life, though more than one explorer has given it as his opinion that certain crops could be raised in the summer months. Undoubtedly the great and enduring drawback to Alaska will be the dark and bitterly cold winter, in the depth of which there are twenty hours of darkness and but four of daylight, and the thermometer goes down, as it did last winter, to 70 degrees below.

Apart from the benefit conferred by the placing of additional gold in circulation—a benefit which in its total effect, however rich the mines may turn out to be, will be considerably less appreciable than is commonly supposed—these gold discoveries give an indirect impulse to trade and quicken the pulse of the industrial world. In this respect the Klondike excitement has already produced a marked improvement on the Pacific coast, and this greatly depressed country seems to be in a fair way to recover some of its old time prosperity.

STEEL WAGON TRACKS ON COUNTRY ROADS.

It is the narrow tires of heavy farm and freight wagons that do the most serious damage to country roads, especially during or after heavy rains, or when the frost is coming out of the ground in the spring. A single wagon track, but slightly depressed below the general surface, forms a channel in which the water will stand on the level and down which it will run on the hills, softening or cutting out the material of the roadway, and preparing the way for the traffic to grind out a couple of deep and unsightly ruts. These results are seen at their worst in a country where the soil is alluvial or clayey; but in any country and on any road except a first-class macadam the destruction of the surface by formation of ruts is only a question of time. The adoption of broad tires on all wagons, and care in filling the ruts, would mitigate the evil; but as things go to-day in most country districts, these remedies are conspicuous by their absence.

The United States Department of Agriculture is carrying out experiments with a view to saving country roads from this quick deterioration. The device consists in laying down in the center of the road two flat steel tracks to the gage of the average farm wagon. The steel rails, for they are nothing less, are to be $\frac{7}{16}$ inch thick and of an inverted trough shape. They will be bedded in gravel laid in trenches, and they will be tied together at the joints and in the middle. On all hills the rails will be slightly corrugated or roughened to enable horses to take a good foothold. In addition to the durability of a road made on these lines, it is claimed that such a road would reduce the tractive resistance from forty pounds per ton on a macadam surface to eight pounds per ton on the trough rails.

It is estimated that the cost of the rails and fittings for a short stretch of road will be at the rate of about $3,500 per mile; though a line several miles in length could be built for about $2,000 per mile. This estimate is for a track which would weigh about 100 tons per mile; a track for lighter traffic, weighing about fifty tons per mile, could be built for half the above named sum. These figures represent the cost of material only, the grading and track laying not being included.

As regards the value of such a road, there may be some districts where its construction and maintenance would be more economical than that of a first-class macadam, but we doubt whether it would prove to be so in cases where the materials of macadam construction are within easy reach. As regards the increased hauling capacity of the steel-tracked road, there is no doubt that it would be greatly increased, though scarcely, we imagine, to the extent—five hundred per cent—claimed by the advocates of the system.

PROPOSED COMPLETION OF THE HUDSON RIVER TUNNEL.

It is gratifying to learn that there is prospect of the early completion of the tunnel under the Hudson River, which was begun in the year 1874, and upon which work was suspended in 1892, when about four-fifths of the work had been completed. It is stated by the legal representative of the English bondholders that steps are to be taken to foreclose the mortgage of $2,750,000, reorganize the company, issue new bonds, and push the work to completion. The tunnel starts from a shaft on the New Jersey side of the river, which is located at Fifteenth Street, Jersey City, and it is to terminate in a shaft on the New York side at the foot of Morton Street. The total distance will be 5,400 feet, and of this, as we have said, about four-fifths have been completed. It was originally intended that the terminus on the New York side should be at Washington Square, but under the new scheme it is probable that it will be placed nearer Broadway. The cost of the undertaking has reached about $4,000,000, and it is estimated that

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the tunnel can be completed by $1,000,000 more. It is likely that the engineers who have just brought to a successful completion the great Blackwall tunnel, London, will have charge of the tunnel under the Hudson, and the fact that they overcame the many serious obstacles encountered in the prosecution of that work is a guarantee that the Hudson River scheme will this time be carried to a successful termination. One of the chief causes of the abandonment was the difficulty experienced in carrying the tunnel through the bed of the river at the point where the overlying material was extremely shallow. A similar difficulty was met in the Blackwall tunnel, but it was overcome by dumping material from barges and forming a false bed to the river. The unfinished tunnel is at present flooded with water, which it is estimated can be pumped in about two weeks' time, and if the work is pushed through with vigor, it will probably take about nine or ten months to complete the whole work.

THE FASTEST TRAIN IN THE WORLD.

The distinction of running "the fastest train in the world" now belongs to the Atlantic City Railroad, which has recently inaugurated a summer schedule which includes a one hour train between Philadelphia and Atlantic City. The palm for fast running which was held for so many years by the Empire State Express had latterly been claimed by the Caledonian Railroad, Scotland, which was running a regular passenger train on a schedule of about 60 miles an hour. This, which was considerably higher than the booked speed of the New York Central train, has in turn been greatly exceeded by the railroad above mentioned.

The new train leaves Camden at 3:48 P. M. and is timed to reach Atlantic City, 55½ miles distant, at 4:40 P. M. The new service was inaugurated by a train which, in spite of the fact that it started 2½ minutes late, reached Atlantic City 1½ minutes ahead of time, the 55½ miles being run off in 48 minutes, or at the rate of 69·35 miles per hour. The train sheet shows that the 4·8 miles between Egg Harbor and Brigantine Junction were covered at a speed of 82·26 miles per hour.

Judged by the mere standard of speed, this was an excellent performance. Even if it had been maintained by a special drawing one or two coaches, it would be worthy of record; but when it is remembered that the train weighed 320,300 pounds and that much of the distance was run against head winds and in a heavy thunderstorm, the feat becomes truly exceptional.

The train was made up of one combination car, three standard passenger coaches, and a Pullman vestibule parlor car. It was hauled by a Baldwin four cylinder compound with cylinders 13 inches and 22 inches diameter by 26 inches stroke. The heating surface is 1,835 square feet, the drivers are 7 feet in diameter and the total weight of engine and tender is 226,900 pounds. The total weight of engine and train was thus about 273½ tons. It will be seen that the locomotive is a very powerful machine, its weight being about two-thirds that of the train, and the distance is short compared with that covered by the Empire State Express. On the other hand, the Atlantic City train was longer by one more car than the New York Central train, and its booked speed is about 11 miles per hour faster.

DEATH OF PROF. McCLURE.

Prof. Edgar McClure, of the Oregon State University at Eugene, fell 300 feet over a precipice on Mount Rainier late on July 27 and was killed. Every bone in his body was broken. He belonged to a party which was ending one of the most successful ascents ever made. At an altitude of about 5,000 feet the party got off the trail. McClure went in search of it. Others followed, but he warned them to go back, as the place was too steep. Just then the snow gave way under him and he fell. The body was recovered the next day. McClure was one of the most successful mountain climbers of the Pacific coast, and was to be made president of the Oregon University, says the New York Sun. The Mazamas party of fifty climbers, of which he was one, will return at once instead of camping out two weeks.

Dr. De Witt Connell, of Portland, Ore., McClure's traveling companion, believes every bone in the professor's body was broken by the fall. His face was lacerated and his skull was fractured. His blankets, which he carried in a roll on his back, were ripped into ribbons, and his instruments for testing the velocity of the wind and the atmosphere for the government were crushed to atoms. The force of the fall was so great that the body rebounded and shot off forty feet from the point where it struck the rocks.

Prof. McClure was married and about thirty years of age. He had charge of the government scientific department of the annual mountain climbing expedition of the Mazamas, the coast Alpine society. He and his friends did not go with the regular party, who numbered fifty, and which made the ascent and descent in safety, using a line. The McClure party used no life line, and that recklessness and traveling by night accounts for the accident. In the darkness the party lost the trail on the Muir glacier. McClure warned his companions to be careful and started to reach what looked like a pile of rocks, a few feet away. The rocks were a hundred feet below. Webster Pierce, of Pendleton, while looking over one of the precipices, became partly deranged and could not ascend the mountain. No barometer has been safely brought down from Mount Tacoma, and McClure, on starting to descend, promised to preserve his at all hazards.

ELEVATED TRIES FUEL OIL—UNSUCCESSFUL EXPERIMENT WITH ONE TRAIN ON THIRD AVENUE.

Engine 49 was run on a trial trip on the Third Avenue elevated road, New York City, August 2, with oil for fuel. The Consolidated Fuel Company was the promoter of the experiment.

A tank containing five barrels of fuel oil occupied the space formerly devoted to the coal bin. The oil was forced through two feeders by a pump, which sprayed it directly behind the boiler, where it was kindled. It took the boiler twenty minutes to generate 145 pounds of steam. At 11:04 the train, composed of five cars, left the Ninety-ninth Street station and started downtown on its way to the City Hall. On board the train were Hugh Moore, president of the Fuel Company; J. S. Zerbe, inventor of the appliance, and Superintendent S. B. Smith.

The motor had much difficulty in pulling the train up the hill at Seventieth Street, and when the Fifty-ninth Street station was reached it was running very slowly and two minutes behind the regular time. The fuel made a great deal of smoke, which poured into the cars in blinding clouds.

At Twenty-third Street the train was six and a half minutes late. Train Dispatcher Morrison, who was riding on the engine, came back and told Superintendent Smith that the pressure had fallen to 45 pounds and that it was impossible for the train to reach City Hall.

The cars were switched back on to the uptown track at Ninth Street and pulled uptown by an extra locomotive, which had been following the train. Mr. Zerbe attributed the failure to a leak in the oil tank.

TRIAL OF A SEXTUPLEX TELEGRAPH SYSTEM.

A sextuplex telegraphic system was successfully operated at Boston, August 2, in the presence of representatives of New York and Boston newspapers. The circuit was to New Haven and return, a distance of three hundred miles. Three different messages were sent over the wire simultaneously, and were easily and accurately received on the receiving sides.

The inventor is Thomas B. Dixon, of Kentucky, son of the late Archibald Dixon, once a senator of that State. He is a practical telegrapher.

"Other experimenters," said Mr. Dixon, "have pursued one of two methods—either they have used a vibratory current or else have subdivided the current into more than two parts. I have virtually a combination of a quadruplex and duplex wire. I send two messages over one-half of the current as a quadruplex, say at 100 volts, and the third message over the other half as a duplex, by increment—by making the current 300 volts. The great gain is in the saving of wire. We can work the sextuplex with the same current that is used on the quadruplex. We have used one quadruplex over thirteen hundred miles of wire on about two-thirds the current commonly employed. Both quadruplex and sextuplex have been used in all kinds of weather, and they do excellent work. The tests have all been made through a district where the wires were exposed to induction. The thirteen hundred mile test was on a wire that ran from Boston to Buffalo, then back to Boston; then to New Haven and back to Boston again."

THE BELGIAN ANTARCTIC EXPEDITION.

The necessary funds having been assured, the steamer Belgica, which has been fitted out at Antwerp, will sail on August 15 on an expedition to south polar waters.

The Chamber of Deputies has voted an additional credit of 60,000 francs for Gerlache's south polar expedition.

Lieutenant de Gerlache, of the Belgian navy, organized and will lead this expedition. The Belgica has been specially strengthened for ice navigation and arranged for the convenience of scientific workers. The vessel is provisioned for three years. A laboratory has been built on the deck, and the expedition will be particularly devoted to geological and zoological research. This Belgian expedition will be the only one in the Antarctic field.

MAGIC: STAGE ILLUSIONS AND SCIENTIFIC DIVERSIONS.

The interesting new book, entitled "Magic: Stage Illusions and Scientific Diversions," will be published about September 1. For further particulars our readers are referred to our advertising columns. A large, four page illustrated circular is now ready for distribution, and will be mailed free to any address.

MOVING TO THE NEW LIBRARY, WASHINGTON.

The old Congressional Library at Washington has been closed, and the work of removing the books to the new building has been commenced, a work which it is expected will take about three months. The moving, according to Assistant Librarian Spofford, embraces "the loading of books from their present shelves in the Capitol building into boxes, separately numbered and ticketed, so as to indicate the place they will occupy in the ironstacked rooms of the new library. Each division will be preserved in distinct order, and such rearrangement and classification as the detailed treatment requires will be gradually worked out. It is proposed to leave in each library division and subdivision enough shelf space for several years' growth, so that no further removal of books need be made for a long time to come."

Supt. Green has an ingenious arrangement for removing dust from the books before they are placed upon the new shelves. He has attached an ordinary rubber hose to the air compressor of the pneumatic tube system, and, to use his language, will just "turn the hose" on the dusty books. Instead of water, however, a stream of air, under heavy pressure, will do the work. At the end of the hose is a broad nozzle, one-sixteenth inch by four inches, which will enable the air to play on the books in a stream the shape of a brush. "It is likely," said Mr. Green, "that the general public has very little idea of the number of people who visit the new congressional library building. All during the spring and early summer our visitors averaged 1500 a day. Even now with the city emptied by the summer exodus, the number is about 1,000 visitors a day."

Assistant Librarian Hutchinson says the new library is "the most gorgeous public edifice in America. It has the largest golden dome in the world, with 10,000 square feet of surface. It is lighted by 1,800 windows; there are 25,000,000 bricks and $1,250,000 worth of granite. Congress appropriated $6,000,000 for its cost. The builder turned over $300,000 to the Treasury of this money when he handed over the keys." In the rotunda or reading room, over which Mr. Hutchinson will preside, there will be room at the tables—allowing four feet for each person to spread himself in—for 260 readers at one time, and this is exclusive of the alcoves for students pursuing some special line of research. On the great dais in the center will stand the librarian and his clerks, taking orders for books and telephoning to the men in the distant book stacks. From the stacks the books will be sent to the reading room in traveling trays like those employed in retail stores for conveying bundles and money. A tunnel three feet underground and containing an endless chain railway connects the library with the Capitol, so that when a member of either house needs a book, even in the middle of a speech, it can be supplied at a moment's notice. The library of Congress ranks sixth among the libraries of the world in its present contents. France has the largest, England next; then comes Russia, and Germany follows with her libraries in Munich, Berlin and Strasburg, the last named holding almost equal rank with ours at Washington.

SALICYLIC ACID IN FOOD.

It is well known to-day that salicylic acid is a powerful antiseptic. As such it retards the action of organized ferments like the yeast plant and putrefactive bacteria. It hinders and prevents fermentation, the souring of milk, and the putrefaction of milk. Its action upon unorganized ferments is even more powerful. It completely arrests the conversion of starch into grape sugar by disease and pancreatic extracts. This action is directly opposed to the process of digestion, and, were there no other reason, the use of salicylic acid should be universally condemned. These facts in connection with salicylic acid have been recognized very thoroughly in legislation. The use of the acid has been condemned by most of the European countries having pure food laws. In France it is forbidden by law. In Austria, Italy, and Spain it cannot be used without the danger of incurring a heavy penalty, and all South American states having pure food laws have absolutely forbidden its sale. The laws of many of the States forbid its use. By a decision of Mr. Wells, the dairy and food commissioner, the use of salicylic acid in food is prohibited in Pennsylvania.

I wish to call attention here to another fact in connection with the use of salicylic acid which is of extreme importance, viz., the sale of preservalines, preservatives, etc., under various high-sounding names, intended for use in private families. A number of these, claimed to be perfectly harmless, are on the market, but actually contain salicylic acid as the main ingredient. The conscientious and careful housekeeper should put an absolute veto upon the use of any such compound. There is rarely any need for them, since, when pure fruits and vegetables are used and the proper directions for sterilizing by heat, etc., are carried out, canned or preserved goods of all descriptions can be prepared that will remain in good condition for years without the aid of any preservative.—The Sanitarian.

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RAILWAY MAIL CATCHER AND DELIVERY DEVICES.

A subject which has been of much interest to inventors through many years, and in relation to which many patents have been issued, is that of delivering mail bags to and receiving them from moving railway trains. Numerous devices for this purpose have been tried with more or less success, but the greatly increased speed with which trains are now run, and the immense growth of the mail carrying business, with the necessity in all cases of securing the promptest possible service, render the attainment of practical success a more difficult matter than it was some years back. With the devices at present in use on many roads, it has occurred that mail bags have been run over and cut to pieces from the delivery arm of the mail car striking a switch stand or something else, the mail being partially destroyed, and even trains have been derailed from this cause, while persons have been killed by mail bags striking them when thrown off a train.

The Post Office Department at Washington, however, has been diligent in seeking for the best forms of practical devices among the many which have been brought forward, and insisting upon their adoption by the railroad companies. With this end in view the department has had many tests made, under the supervision of experts, and now gives its official approval to three different devices of this character, such approval having been withdrawn from a fourth device, "until certain defects which cropped out in the practical use of the device are remedied."

One of the devices thus expressly approved by the Post Office Department, and manufactured by the Fleming Mail Catcher and Deliverer Company, is shown in the accompanying illustrations, one of the larger views showing the mail car approaching the station, with its bag held out ready for delivery, while the mail bag at the station is held on an extended arm of the device, ready to be taken upon the car; the other view showing both of these operations completed, the car having delivered and received a mail bag.

The standard of the mail crane, at the side of the track, has at its top a pivoted, counterbalanced supporting bar, at whose outer end is a cross bar having at each end a dependent hook, and from one of the hooks the station mail bag is suspended by means of a ring. Lower down on the standard is a catch arm which assists in holding the bag in proper position, the catch arm being connected with the standard by a universal coupling which permits it to swing both horizontally and vertically. The catch arm has at its outer end a cross bar with notches adapted to engage the station mail bag ring, and with detent fingers to retain the car mail bag ring, when the latter bag has been delivered, as shown in the second view.

On the mail car a sleeve with inwardly extending handle turns on a supporting rod arranged across the doorway, and an outwardly extending arm of the sleeve carries at right angles to its length a needle-like catch arm adapted to hold on the rear end the bag which is to be delivered at the station, the bag being supported by means of a ring, as in the former case. There are also holding springs or catches, preventing the bag from becoming easily detached until engaged by the catch arm at the station. A retaining arm also bears against the mail bag ring to hold it at right angles to the car in proper position for engagement by the catch arm and prevent it from being shifted by the wind or the motion of the car.

As the mail car moves past the mail crane, the mail clerk or attendant on the car, by turning down the handle, holds the mail bag extended, the arm on which it is carried entering the ring of the station mail bag, and taking the latter from its supporting arms, while the catch arm of the mail crane enters the ring of the car mail bag and removes the latter from its support. Owing to the speed of the train, the car mail bag is thrown against the catch arm with considerable force, and the arm is swung horizontally at the same time that it drops, by reason of its universal coupling connection with the standard, striking the chain by which the counterbalance weight is supported, whereby the blow is cushioned and the arm and the bag are brought to a state of rest with a minimum of jar or strain. At the same time the operator on the car, by releasing or turning up the handle, withdraws the extended arm and brings the bag which has been taken up at the station to the door of the mail car. The ring holding, catching and cushioning devices are identical on both sides of the mail crane and the carrying arm of the car, so that mail bags may be exchanged when the car moves in either direction.

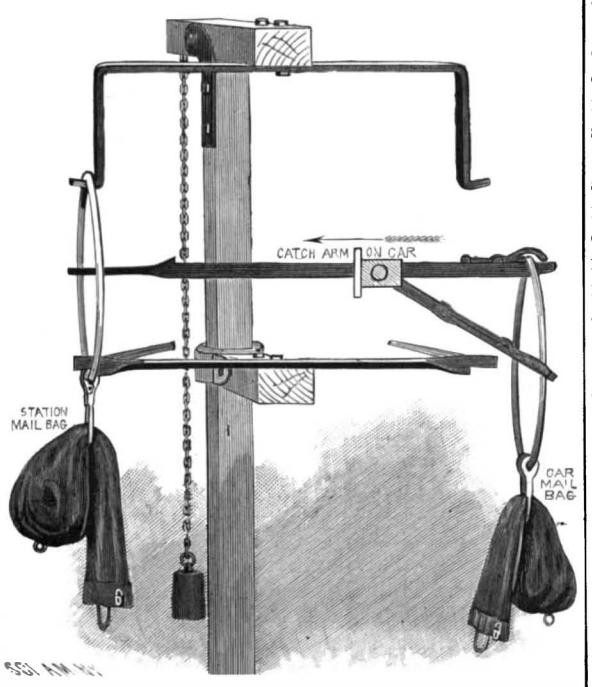
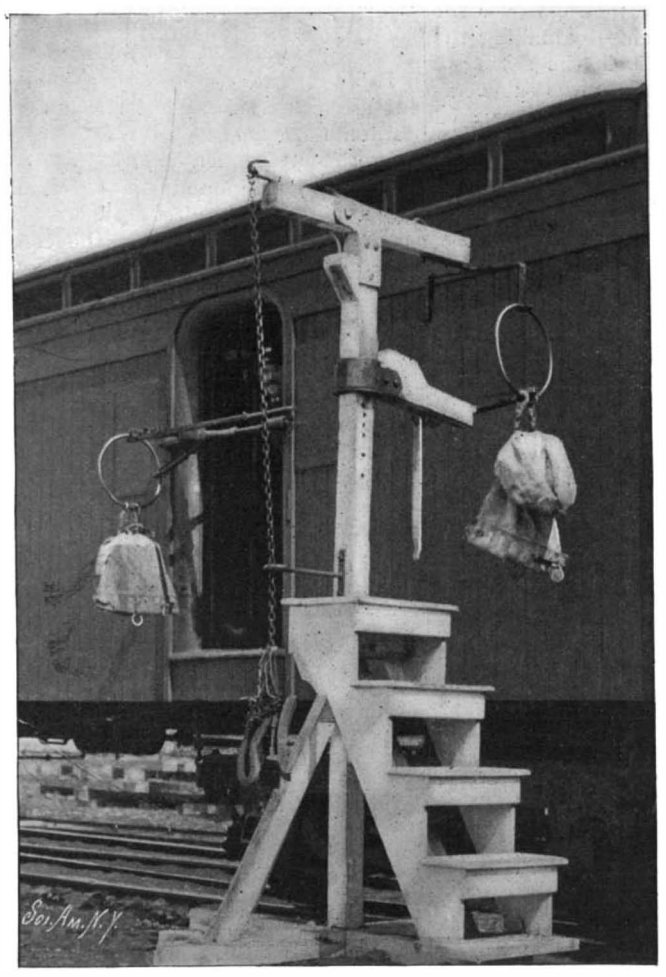
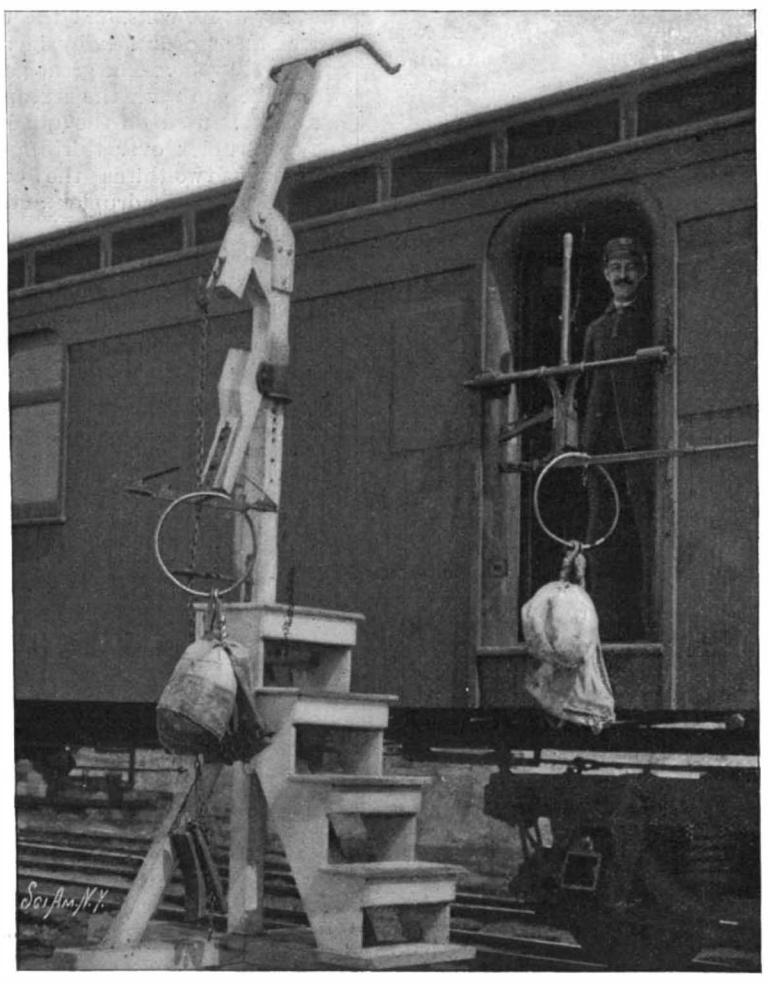


DIAGRAM SHOWING TRANSFER OF MAIL BAGS.

The system shown has been in successful use for more than two years on leading railway lines, without any throwing or kicking off of pouches, and without danger to the trainmen or mail clerks, while the delivered mail is positively and securely hung in a safe place. The extended arm of the catcher, also, is short, and not likely to strike an obstruction near the track. From the manner in which the mail sacks are suspended from rings, it is obvious that there must be a saving, under this device, in the cost of repairs for mail pouches, as compared with former methods, according to which the pouches were caught up by hooks. The expense to the government on this account for the year 1894 was $128,781.



BEFORE.



AFTER.

THE FLEMING MAIL CATCHER AND DELIVERER.

Do Earthquakes Vary with the Time of Day?

Students of earthquake phenomena have for a long time believed that the violence of earthquake shocks was greater in the morning than in the afternoon; in other words, that the earthquake activity varies throughout the day in a manner similar to that of the barometer. Mr. C. Davidson examined the question very closely, and reached the following conclusions. The data which he used were the curves furnished by registering instruments, which were installed in Japan and in the Philippine Islands:

"1. The daily variation of the frequency of earthquakes finds support in the approximate agreement of observations during the entire year at Tokyo and Manila, and for the middle of summer and winter respectively, at Tokyo.

"2. In the course of ordinary earthquakes, there is almost always a marked daily period, whose maximum is generally between 10 A. M. and noon. The half-daily period, the less apparent, is just as clearly marked; its maximum is always between 9 A. M. and noon and between 9 P. M. and midnight Other lesser agreements have also their own importance. . . .

"3. Although there are not sufficient data to draw a complete conclusion, it seems that the daily periodicity of the feeblest shocks is the most marked.

"4. In the case of the return shocks of great earthquakes, the diurnal periodicity is always strongly marked. The maximum of the daily period occurs several hours after midnight, but the epochs of the others are subject to great variations, due, no doubt, to the short intervals that separate the indications of the registering instruments. A peculiar feature of the return shocks is the more marked value of the eight hour and four hour components. . . .

"It appears not improbable that the daily variation of ordinary earthquake shock is chiefly due to the velocity of the wind, and that of the return shocks principally to the barometric pressure."

International Association for Testing Constructive Materials.

The following is the substance of the statutes adopted by the international congress. The object of the association is the development and unification of test methods for determining the quality of building and other materials, and improving apparatus for the purpose, by the deliberations of the association, by congresses, by the publication of a journal, and by any other measures that may be deemed advisable, the necessary funds being raised by the annual subscription of members, profits on the journal, and donations Candidates for admission must be proposed by two members of the association, while authorities, constituted bodies and societies will be admitted on their application, which must be addressed to the president. The annual subscription is 5 fr. (4 marks or shillings). Each member, who must undertake (on being elected) to contribute to the success of the association's objects to the extent of his ability, has the right of voting and also of receiving the journal at a reduced rate. The business of the association is carried on by (1) the managing committee, consisting of the president, vice president, three assessors, and members elected by the congress on the proposition of the council, their functions extending from one congress to another—generally a period of two years; (2) by the council, composed of delegates elected by members of the association in the different countries; and (3) by the congress.

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SIR JOHN EVANS.

BY MARCUS BENJAMIN, PH.D.

The distinguished scientist who will succeed Sir Joseph Lister as president of the British Association for the Advancement of Science has long been favorably known in this country for his studies in archæology, geology and numismatics, and the following brief sketch of his career will be of interest to those who know him only as the one who has been chosen to preside over the meeting of the British Association to be held in Toronto next week.

John Evans is a son of the late Rev. Dr. A. B. Evans, who for many years was head master of Market Bosworth Grammar School in Leicestershire, England, and was born in 1823. He received his education under his father's direction, during which time he developed an interest in scientific studies. These, however, have been for the main part his recreation and pleasure, while the chief occupation of his life has been that of a paper manufacturer, in which he has been successful, and he was for some time the president of the Paper Makers' Association.

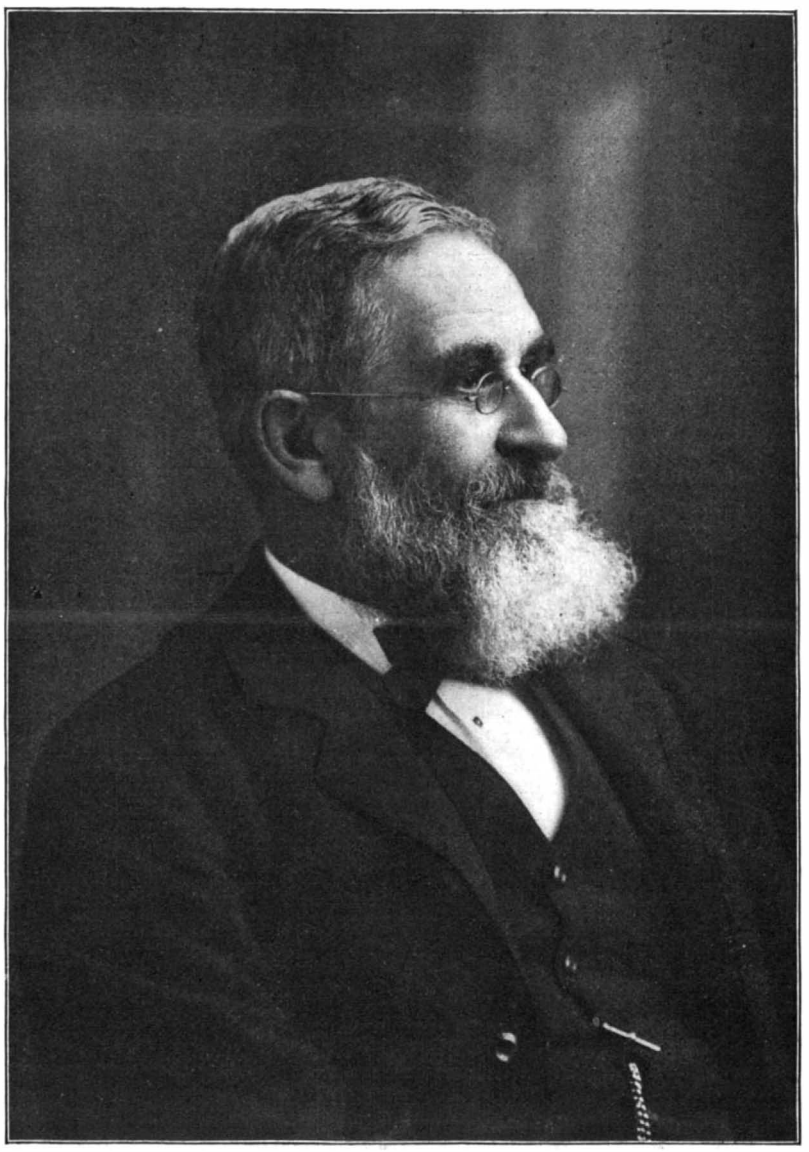
His first important book was one devoted to numismatics, and his "Coins of the Ancient Britons," published in 1864, gained for him the Allier d'Ilantersche prize from the French Academy. Among his best known archæological works are the "Ancient Stone Implements, Weapons and Ornaments of Great Britain," which he published in 1872, and of which a French translation appeared in 1875. Also his "Ancient Bronze Implements, Weapons and Ornaments of Great Britain and Ireland," which was published in London in 1881 and in Paris in 1882.

Dr. Evans has also written papers on "Flint Implements in the Drift," and other archæological papers for the "Archæologia," and he is a contributor to the Numismatic Chronicle, of which he is one of the editors.

The honorary degree of D.C.L. has been conferred upon him by Oxford, and that of LL.D. by Dublin, and that of Sc.D. by Cambridge. More recently he has been made a knight commander of the Bath. His own associates have honored him conspicuously, for, in 1875–76, he was made president of the Geological Society; in 1878–79, of the Anthropological Institute; in 1875–97, of the Numismatic Society; and in 1885–91, of the Society of Antiquarians. In consequence of the latter office he is an ex-officio trustee of the British Museum. He has long been a member of the Royal Society and is now one of its vice-presidents and its treasurer. Of many foreign learned societies he is also an honorary member, and is a correspondent of the French Institute in the Academie des Inscriptions.

Sir John Evans has his home at Nash Mills, Hemel Hempstead, and his neighbors have testified to their appreciation of him by electing him a justice of the peace and deputy lieutenant for the county of Hertfordshire, where he also served as high sheriff in 1881–82. He is chairman of quarter sessions for the St. Albans division of Herts, and also vice-chairman of the Hertfordshire County Council.

The knowledge and experience of Sir John Evans fully demonstrate the wisdom of selecting him to preside over the meeting of the British Association, and we hope that the splendid welcome that he will receive from his American confrères will fully compensate him for his visit to the new world.



SIR JOHN EVANS.

English versus American Locomotives in Japan.

It is very interesting to note the discussions which go on in the Japanese journals on the relative merits of English and American machinery and manufactures. The great development of railways in Japan has naturally led to the discussion of the relative merits of English and American locomotives. In a recent issue of the Chuo Shimbun the editor reproduces the arguments advanced by the advocates of each class of engine. The speaker in favor of the English engines appeals to actual experience, and expresses the opinion that, judged from that point of view, there is no need for discussion. He points out that when Viscount Inonye was at the head of the railway bureau, he resolved to make a trial of American locomotives, and in 1891 two were imported. The result of the experiment was thoroughly unsatisfactory, for within a year they were useless. He then enters into a long account of their defects, which, if at all correct, shows that they were deficient both in design and workmanship. After Viscount Inonye's retirement, his successor, Mr. Matsumoto, who had received part of his education in the United States, and who has therefore a great leaning for things American, imported in January, 1894, four American locomotives, which, however, fared no better than their predecessors. From the very outset repairs and alterations were required, and after a year or two the whole four were virtually condemned. After this experience the railway bureau decided that the English engine was the better; and recently, when an order was given for eighteen locomotives, it was stipulated that they must be of English make. The writer in favor of the American locomotives expresses the opinion that it is a mistake to judge so hastily on the subject, as the engines hitherto imported by Japan from the States were not of the best kind. He says that there are other and better makers of locomotives in the States, and that it is absurd to suppose that the Americans cannot make good engines. Even Japan is beginning to develop that ability, and America is not new to the work as Japan is, as she has been at it for years. Above all, she can turn out much cheaper locomotives than England can, there being a difference of as much as one-third of the price in favor of the American engine. This means, of course, that, if the American locomotive lasts seven years against the English locomotive's ten, the advantage is still on the side of the former. He makes the rather astonishing statement that materials and labor are cheaper in America than in England. Probably he is nearer the truth when he says that the British manufacturer is a stiffbacked person. He has been at the top of the manufacturing tree for such a long time that he fails to observe the changes going on below. He will not concede anything to a customer or make any effort to suit the latter's convenience. But the American is looking for custom, and will spare no pains to reduce his prices or accommodate a client in any other manner. In conclusion, he adds that the proof that the Japanese government understands these things is that it has recently ordered eighteen locomotives from Rogers, and they are to be examined and passed by Mr. Crawford, an American engineer formerly in Japan. We believe that Mr. Crawford was the first engineer of the Hokkaido Railway, and introduced cheap methods of construction, which, however, were not followed. On this subject we may note that the question of state versus private railways is at present being much discussed from all points of view. The general conclusion seems to be that all railways ought to be built and superintended by the government but worked by the people, as experience in Japan shows that official lines are managed with a degree of officialdom to which the public has a right to object, and private lines are built on principles so commercial as to be distinctly dangerous. The intelligent expression of public opinion which is taking place on these matters is certain in the end to lead to efficiency and public convenience.—Engineering.

Guides to Gears.

To have the wheel you ride properly geared is so very important that two points must always be borne in mind when buying machines. One is that the novice, even though he may be strong and muscular, cannot use as high a gear as the man who has had long practice in pedaling, for not only will the particular muscles called into requisition in riding require to be developed, but the novice has not the knack of exerting his powers to the best advantage. The other point is that gears which were suitable on a machine built several years ago are not, as a rule, high enough on a thoroughly up-to-date machine, since the latter is lighter, easier to propel, and faster than the former. For this reason it will be found that experienced riders have slightly raised the gear every season for years past; and the fact that they can now use, with perfect comfort, a comsiderably higher gear than they could a few years ago they attribute partly to practice and partly to improvements in the manufacture of machines.

It is very difficult to lay down definite rules for the guidance of others in deciding on the best height of gearing, as the most suitable gear depends on so many conditions. The first and perhaps the most important question is the character of the rider's muscles. If he is strong, but slow in his movements, he will certainly need a high gear. If he is weak, but quick, he will need a low gear. But the character of the machine he is riding also has to be taken into account. With a heavy machine fitted with full roadster tires, the gear must not be as high as with a light one equipped with racing tires, and with 6 inch cranks it must not be as high as with 6½ inch. Another very important consideration is the nature of the roads to be ridden over. In a level country, blessed with good roads, a much higher gear can be ridden than in a hilly country; and, again, if the rider only goes out when the roads are dry, higher gear can be ridden than if he goes out at all times, no matter whether roads be dry or muddy.

While it is not the intention of this article to recommend to the average cyclist a very high gear, yet it cannot be denied that many riders fall into the error of having their machines geared too low. Although low gearing requires less pressure on the pedals, it necessitates moving the feet round faster, and thus in reality adds to the amount of work which has to be performed by the energy which the rider expends. In any case, the machine and its load have to be propelled, but with a low gear the rider's feet and legs have to be raised a greater number of times. Of course, the low gear has the advantage up hill or against a wind; but at other times the rapid movement of the legs is apt to become exhausting, besides which, it makes ankle action very difficult, if not impossible, and increases the liability of the rider to lose his pedals, and danger in regaining them. Far more riders complain that the gears they use are too low rather than too high. As to back pedaling, no doubt that a low gear is, on the whole, the best for holding a machine back going down hill. But even here the advantage is not always on the side of the low gear, for the pedals may go round so fast that the rider can do nothing with them. What any experienced rider eventually learns to believe in is a moderately high gear and a good brake.

The average woman's wheel should be geared some half dozen inches or more lower than that of the average man; but in each individual case the precise gear which will be most suitable can only be determined by a careful weighing of all the points which have been mentioned above.—The Wheel.

Coloring Marble and Similar Stones.

A newly discovered process for treating marble or other similar stones in order to give them any colored shade, veins or spots, says the Chicago Tribune, consists in leaving these stones in one or more baths composed of a solution of alcohol and one or more colors of aniline or other coloring materials. The coloring materials are fixed by leaving the colored stones in a bath of oil or any other fat substance, or by applying upon the stones layers of the same stuff. The absorption of the organic coloring materials and of the fat substances by the stone may be accelerated by heating or boiling the bath which contains the stuff to be treated.

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THE UTILIZATION OF NEW YORK CITY GARBAGE.

It was only a question of time before the city of New York should awaken to the necessity of finding a better way of disposing of its wastes or general refuse than by emptying it into the sea, a practice which was at once pernicious and wasteful. That it was pernicious is proved by the unsavory and unsightly fringe of rubbish which the sea has cast up on the shores of New York Harbor and the Jersey coast. Moreover, the heavier matter, settling to the bottom, became, under the influence of the tides, an active agent in silting up the entrance channels of the bay. That the practice of dumping at sea was wasteful is proved by the fact that it has lately been shown that there is sufficient commercial value in a considerable portion of the city refuse to more than pay for the cost of its collection.

In former days the household refuse, consisting of ashes, garbage (table and kitchen wastes), and paper, rags, etc., was collected indiscriminately and taken to the scows. The present system requires the householders and the management of hotels and industrial concerns to place their refuse for collection in separate lots, according as it is ashes, garbage, or light refuse. By this threefold division the city wastes acquire a positive value, each class being available for some specific use.

Under the head of ashes is included not merely the residue from boiler furnaces and household grates, but such material as broken crockery, oyster and clam shells and all material that is suitable for filling-in purposes. For a description of the methods of handling this matter the reader is referred to the issue of the SCIENTIFIC AMERICAN for June 5, in which are illustrations of the new steam dumping scows, which are to be employed in carrying away the ashes—at present to the outside dumping ground, but ultimately to Riker's Island, at the entrance to Long Island Sound, where it will be used for reclaiming swampy ground.

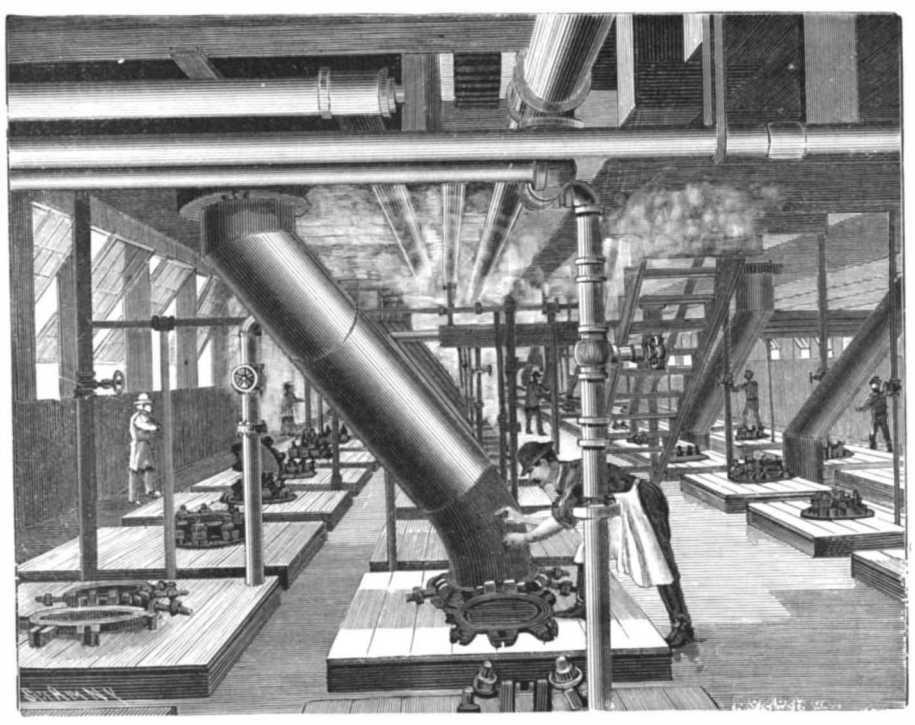
The present article is devoted to a description of the plant on Barren Island for the disposal of garbage—the second class of refuse—and in an early number we shall give an account of the experimental plant which the city has in operation at the foot of Eighteenth Street, on the East River, for the handling of the third class of refuse, such as paper, rags and kindred matter.

Under the present system the garbage is carried by the carts of the street cleaning department to seven different dumps conveniently situated along the river front. Here it is loaded into the scows of the New York Sanitary Utilization Company and is towed by their tugs to the large factory on Barren Island, views of which will be found on the front page of this issue. The garbage is taken away daily, and the amount removed averages about 800 tons per day throughout the year. At the factory it is unloaded onto the buckets of a large cantilever elevator which has a capacity of handling a thousand tons of this material per day.

This work was formerly done by single hoisting buckets, but the operation was slow, and the present large elevator has lately been installed in their place.

When the conveyor is at work the outer end of it rests upon the deck of the scow, and the upper end delivers the material onto a small cross conveyor, which in turn feeds two large inclined elevators which carry the garbage up to the top of the factory.

Here it is delivered into bins from which a series of large swivel pipes lead down to the mouths of what are known as the digesters. There are forty-eight of these digesters in all and they are arranged in rows of four through the center of the building. Each of the swivel pipes swings through a sufficient radius to reach the top of four digesters. The latter, which are large cylindrical tanks of plate steel, 5½ feet in diameter and 18 feet long, are arranged vertically as shown in the illustration. They are tapered at the ends, the mouths being closed by steamtight covers and the bottom terminating in a short lengths of pipe which are furnished with large stop valves. After the digesters are filled with the garbage, they are hermetically sealed and steam at 50 pounds pressure is admitted through the lower cone. The cooking is allowed to go on for a period of eight to ten hours, until the garbage is thoroughly disintegrated and reduced to a pulplike consistency, all germs in the meantime being thoroughly destroyed. The matter is then dropped into twelve storage tanks, there being four digesters to each tank. On the outside of each tank there is a curved telescopic delivery pipe, and through these the matter is unloaded onto the press platens carried upon small trolleys, which are run underneath the pipe for this purpose.



TOP OF DIGESTER ROOM SHOWING PIPE FILLERS.

Upon the platen is placed a mould or outer frame which is covered with burlap, and after a sufficient amount of the material has been run into the burlap to fill up the mould, the burlap is folded over above it and covered with a rack or wooden gridiron about ½ inch in thickness. Another mould with burlap is placed above this and more of the cooked garbage is run in, the process being repeated until there is a pile about 4 feet in height. This is then run into the presses, where it is subjected to a pressure of 250 tons. The presses work at a very slow speed, and it takes about three-quarters of an hour to compress the mass from 4 feet to 18 inches. The material, which is now in cake form, passes to the "strippers," men whose task it is to remove the burlap and take the cake from the moulds. It is then carried by conveyors to the drying room, where it is put into a dozen cylindrical steam-jacketed driers. A steel shaft carrying a set of arms rotates in the interior of the drier, and serves to pulverize the material. When this operation is complete, the material is unloaded through a bottom door into a conveyor, by which it is carried to the screen room, in which are a series of revolving cylindrical screens. Here all rubbish, such as fine metal, bits of tin, rags, and similar material, is separated from the "tankage," which falls through the sieves as a fine powder. Tankage is the name given to this powdered material. It is used for fertilizer filler, and for that purpose is sacked and shipped to the fertilizer works. At this stage of the process it contains 4½ per cent of ammonia, 14 per cent of bone phosphate, and ⅓ of 1 per cent of potash.

The grease and water from the presses is led by pipes to a set of settling tanks, ten in all, which cover a space 20 feet wide by 75 feet long, the depth of the tanks being 6 feet. Here the grease rises to the surface and is recovered in catch basins. In the illustration on our front page showing these tanks the workman is employed in skimming off any mechanical refuse which may be floating on the top of the tank. From the catch basins the grease is pumped into a large storage tank, from which it is barreled for shipment. It is used for the manufacture of soap, candles, etc., and is known commercially as "soap grease." The water from the presses, which contains about 14 per cent of soluble ammonia and 1½ per cent soluble potash, is pumped into a large evaporator in which these substances are recovered, and the product is then mixed with the tankage and serves to raise its quality and value. In addition to the plant already erected, the company is about to put up a plant to work the refuse screenings, which will be cremated in retorts and will yield a certain amount of sulphate of ammonia.

It will thus be seen that the unsightly mass which reaches the factory on the garbage scows is transformed ultimately into two most essential and valuable commercial products—fertilizer and soap. It is certainly a triumph of science and art that the material which we reject from our tables should render us service once more as the producer of food and agent of cleanliness.

Barren Island, the site of the above very interesting plant, is about five miles distant from Canarsie and lies one mile distant from the eastern end of Coney Island. It is in some respects the most unique spot to be found in the United States, for within its restricted area—it is about half a mile wide by one and a half miles long—are five different factories, all of which are devoted to the reduction of animal and vegetable wastes to commercial products. In addition to the works we have just described there are also a fish factory, a phosphate works, White's rendering factory and another smaller rendering factory. The employes and their families number 800 and in the course of the year over $250,000 are paid out in wages. We are informed by Mr. Thomas F. White, who is largely interested in the utilization works and the various other factories on the island, that the health of the community is remarkably good throughout the year. We are indebted for facilities in the preparation of our illustrations to Mr. White and Mr. McDonough Craven, C.E., of the New York Street Cleaning Department.

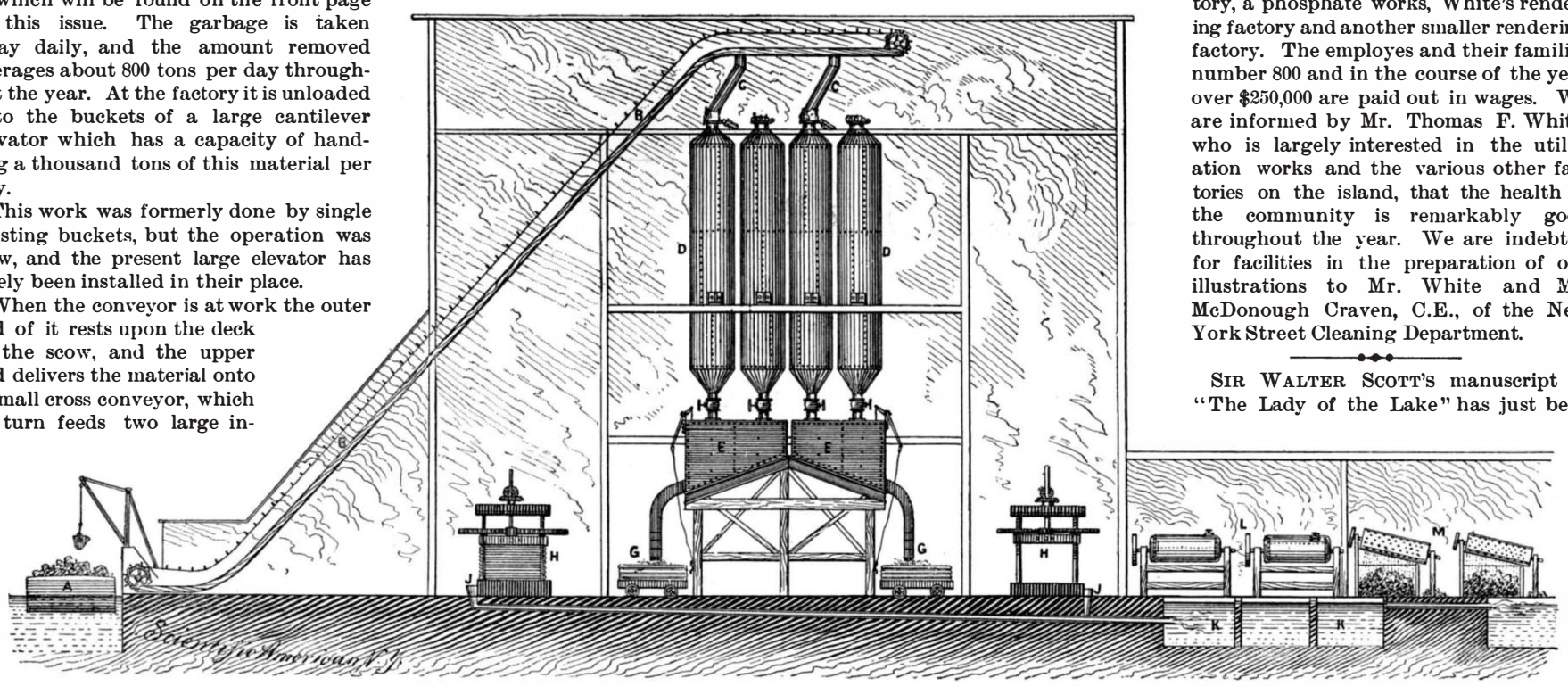


DIAGRAM (NOT TO SCALE) SHOWING PROCESS OF GARBAGE REDUCTION.

A. Scows with garbage. B. Garbage elevator. C. Pipe fillers. D. Digesters. E. Storage tanks. G. Press platens and trolleys. H. Presses. J. Pipes to settling tanks. K. Settling tanks. L. Steam driers. M. Screens.

SIR WALTER SCOTT'S manuscript of "The Lady of the Lake" has just been sold in London for $6,450; thirty years ago it brought $1,385. The manuscript of "Old Mortality" sold for $3,000. Lord Nelson's autograph memoir of his own life with some autograph letters was sold for $5,000; twenty-three other letters of his to Trowbridge fetched $1,400. Robert Burns' private journal, begun in 1787, "The Edinburgh Commonplace Book," brought $1,815. Eight manuscripts of A. C. Swinburne, poems published in his first volume, sold for $198.

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Science Notes.

According to the Journal de Médecine de Bordeaux, a man placed under arrest for illegal practice of medicine, claiming to be a graduate of an American college, presented a diploma which excited the suspicion of the magistrate. Calling in the services of an expert, the document was submitted to the action of a Crookes tube, and the result showed distinctly the outlines, in the substance of the paper, of a name which had been erased from the surface to make room for that of the man who was convicted upon this evidence.

Dr. Judson Deland, of Philadelphia, has invented an instrument for counting blood corpuscles. It works on the centrifugal force principle, and accomplishes the measurement by means of comparative bulks. A quantity of blood is placed in a finely graduated tube and the latter revolved at a speed of about 1000 revolutions a minute. The corpuscles divide by force of gravity and form on the side of the tube in easily traceable divisions of red corpuscles, white corpuscles, and serum. The new method permits of larger, and consequently more representative, quantitatives being used in experimenting, besides doing away with actual microscopic counting.—Microscope.

The results of some recent researches on the direct union of carbon and iron at a high temperature have been communicated by the author, M. Moissan, to the French Academy of Sciences. He states that when pure iron and carbon are melted together in an electric furnace and allowed to cool slowly, the metal is found to contain only a very small quantity of combined carbon, a gray pig iron being obtained that solidifies at 1,150° C. By suddenly cooling in water iron saturated with carbon at 3,000°, the metal became crystalline in structure, and from it were separated brilliant crystals of the carbide of iron, identical with that occurring in steel. Though this was one of the first metallic carbides known, it has proved the last to be prepared in quantity by direct synthesis.

It was announced recently, says the Electrical Review, that the National Meseum, at Washington, D. C., had secured the famous Cyrus W. Field collection of documents, autographs, telegrams and cablegrams relating to the first Atlantic cable. It has been donated by Mrs. Isabella Field Judson, of Dobbs Ferry, N. Y., and is being arranged for exhibition by Prof. Maynard. The journal kept by Mr. Field, and the notes of deep sea soundings made by him and the officers of the Great Eastern, are part of the collection. Mr. Field's private library forms another part of it. There are also copies of medals presented to him by Congress and the French government, engraved resolutions passed by members of bodies in this country and Europe, a cane made from the wood of the Great Eastern, cases containing sections of the first cable, and those evolved from it, and the globe used by Mr. Field while working out his plans.

The electric light has been used in night fishing, and now a French entomologist has devised a plan to secure specimens of insects. He took an incandescent lamp of three or four candle power, he then placed a small portable battery on the bank of the pond. The battery was connected with the lamp by wire; the lamp was fixed to a semicircle of iron, and below the semicircle and lamp was placed a large net having an opening thirty-two inches across and similar to those used for snaring birds. The whole contrivance was lowered very slowly into the pond, the current was turned on and the lamp lighted. The insects, fish, larvæ, frogs, tadpoles, etc., rushed in in great number. A string is now pulled which closes the net, and by a single movement several pounds of victims may be captured, with a considerable number of fish and tadpoles that happen to be in the pond. A small Geissler tube can be used in the same manner.

Schumburg (Deutsch Med. Woch., No. 10, 1897) describes a new method of sterilizing water by the use of bromine, one grain being sufficient to destroy all the bacteria in one quart of water, the bromine afterward being neutralized by ammonia, so that a clear and tasteless water is obtained. For this purpose a twenty-per cent solution of bromobromiodide (bromiodide, one part; bromine, one part; water, five parts) is used. Thirty minims of this solution are sufficient to sterilize in five minutes one quart of river water. If the water is very hard or very foul, the lime salts and the ammonia contained in it neutralize a part of the bromine, and in such cases it is necessary to add the bromine solution until a faint yellow color is obtained and persists for at least half a minute. An equal quantity of a nine per cent solution of ammonia suffices to neutralize the free bromine. It is desirable that these amounts should exactly correspond, although a faint taste either of bromine or of ammonia is not objectionable. When the bromine is exactly neutralized, the water is clear and can scarcely be distinguished from the original water, while the amount of bromine salt which it contains is so small that it has no effect upon the system. This method bids likely to be of especial use in times of epidemic, in war, etc.

Equilibrium in Flight.

BY JAMES RICHARDSON.

In a critical review of recent progress in aeronautics, Mr. Octave Chanute, the well known engineer and promoter of aviation, pointed out a fatal defect in most if not all the attempts that have been made to fly by mechanical means.

"The machines," he said, "have almost always come to grief for lack of that stable equipoise which the bird maintains by instinct under the varying conditions of flight and wing."

Without assured equilibrium safety is uncertain; and without a reasonable degree of safety, flight, whether for pleasure or for business, is out of the question.

In Mr. Chanute's judgment—a judgment shared apparently by most workers in this field—the surest and least difficult way to discover and demonstrate the means required for meeting this primary and most imperative need in flying machinery is through imitation of soaring birds. Such birds rise high and fly fast, apparently with little effort, by taking advantage of the action of the wind on their outspread pinions. Men, it is asserted, should study their structure and copy their methods; a slow, costly, and essentially hazardous process, but the best.

"The experimenters will doubtless meet with many failures and mishaps. They may break their machines and possibly their limbs; but there seems to be no safer or surer way of ascertaining the exact conditions which will have to be met in practical flight."

This sounds reasonable; yet it involves several unproved assumptions. For example, that if men were to work out something equivalent to the bird's equipment for flying, they could use it as a bird does, or learn to do so. But that is simply impossible. A man on a machine and a bird in a body are very differently situated. Consider a young bird when about to leave the parent nest. Its physical organism is complete—that is, structurally complete. It has everything to fly with that an old bird has. But it cannot fly, though it may flap its wings with regularity and vigor. It gets into the air more or less, but its progress is erratic, and its early flights end in tumbles. Thanks to its light and elastic structure, the bird can tumble without serious risk of injury, and it keeps on trying and tumbling until it has acquired the difficult art of keeping its balance in air. Instinct does not teach the art any more than reason could. It has to be learned in action. The proper nerves have to acquire, in connection with the proper muscles, the habit of feeling and counteracting all balance disturbing influences instantly and harmoniously, not through conscious perception and volition, but automatically, without thought or hesitation. By virtue of inherited capacity the young nerves and muscles learn fast and do not forget; and in a little while the bird ceases to tumble, and flies steadily, if not gracefully.

Very different is the case of man with a machine of his own making, however wisely planned or skillfully constructed. The members of a lifeless machine have no sensibility, no capacity for learning, no power of independent action. They cannot acquire habits by use. Besides, the engineer in charge of a machine is something apart from the machine, and can never be so closely in touch with its working elements as a bird is with its bodily members. As a consequence, he can never do with the machine what a bird can with its body, and the bird's best, volitionally, is not enough to insure its equilibrium in air. The engineer may be quick to see, prompt in action, and infallible in judgment. And the machinery at his command may respond perfectly to its controlling valves or levers. But action by the roundabout way of perception and volition will not be quick enough to meet the exigencies of flight in his case any more than in the case of a bird. Educated nerves and muscles will automatically do the right thing ten times while the mind is perceiving the need of the action and ordering it once. Having an inherited capacity for acquiring the habit of performing such instant, unordered, infinitely various yet harmonious muscular movements, the bird can learn to balance itself in air. Lacking such capacity, the machine never can, neither directly nor by proxy.

Just here the designer of a flying machine encounters a new and peculiar problem, one that never arises in connection with earth-supported machinery. If he wants to fly securely, he must make a machine that will balance itself. He must give it a mechanical substitute for the bird's sense of poise and capacity to maintain it. And the machine must not only balance itself, but do it forcefully, since the influences tending to upset a flying machine are apt to be violent as well as sudden in action. Only a positive, unresting, powerful working device will meet the demand. More than that, the device must do its work in practical independence of the engineer. The stability of the machine in air cannot safely depend on any man's perception or judgment or volition.

These difficult requirements are as imperative as fundamental. They cannot be minimized or avoided without constant peril. At all times while the machine is off the ground the balancer must be not merely in readiness, but in action, with a steadying force competent to overcome any influence likely to disturb the equilibrium of the machine, whether acting constantly like gravity or intermittently like varying air pressures due to change of wind or speed.

This necessity is apt to be overlooked. The maintenance of equilibrium is usually made an incident of flight; to be secured by shifting ballast or by means of inert structural devices for the air to act or react upon. As a consequence, most attempts at flight end in disaster. In steady winds or with considerable speed in still air such things may serve. But the air is seldom still, winds vary in speed and in direction, and the machine cannot always be moving with the requisite speed to insure stability. Wings may be folded, sails furled, and fan-like aeroplanes closed or opened to vary their action, but not with the promptness and exactness needed for safety. And it must not be forgotten that any structural devices capable of supporting or steadying a machine in air under favorable conditions of wind and weather must offer the same areas for adverse forces to act on in sudden emergencies. The balancing mechanism of a flying machine must not only be active and efficient, but constant in action and incapable of being taken by surprise.

For insuring equipoise the working elements of the lifting, propelling and steering machinery are as little to be trusted as inert structural devices. Of necessity their motion is inconstant, and must be arrested at times without reference to balance disturbing possibilities, making them least efficient as balancers perhaps just when equilibrium is hardest to maintain. The faster the machine flies and the higher it goes under such conditions, the worse for the rider—when he falls; and he is sure to fall sooner or later.

It would be a good thing to fly, no doubt; but men can live without flying; and most men will prefer to worry along on the earth rather than rise above it at the risk of their necks. Safety is the first consideration; speed, economy, and the rest are secondary problems.

True, some men are willing to risk their lives in air, the forty-seven showmen, for example, who were killed last year fooling with balloons; but they are as little to be considered typical men in this connection as rational promoters of aerial navigation. They were chiefly sensation mongers. The unfortunate Dr. Wolfert and the more venturesome and possibly more unfortunate Dr. Andrée belong to a different class. So too, Herr Lilienthal, and others like him, who risked life or lost it experimenting with soaring devices. Their aims were in all respects commendable in purpose and their efforts have been useful; chiefly however in showing that bulky and fragile constructions for wind sailing are as ill adapted as balloons for practical aerial navigation. Free flight, self-sustained, self-balancing and reasonably independent of wind and weather, from definite startings to predetermined landings, with comparative safety by the way, seems incompatible with such appliances.

To get into the air is not as hard. Many have done that to their sorrow. To stay in the air master of the situation is another matter. To be able to rest in air without risk of overturning, competent to move in any direction at will, and able to return to the point of starting surely and without shock—that is the critical test.

When man has made a machine that will lift itself a foot from the ground and remain poised there in any ordinary weather, he can safely venture further. When all its movements have been thoroughly proved, close to earth, higher and faster flights will be in order, and will not be foolhardy or useless, as premature flights are sure to be.

Above all, the maintenance of equilibrium should be and practically must be the first problem settled. It is a prerequisite: not something to be worked out in air or after all the other elements of the flying machinery have been perfected. Suicide, however scientifically or picturesquely attempted, is not commendable: and smashed machines, however cleverly constructed, are not worth any more than dead inventors for the promotion of aerial navigation.

Our New Supplement Catalogue.

There are still a large number of readers who have not sent for our new 1897 catalogue of valuable papers in the SCIENTIFIC AMERICAN SUPPLEMENT. This catalogue is sent free to any address in the world. A special edition, on heavy paper, has been printed, and this edition, which is cloth bound, is supplied at the nominal price of 25 cents each copy. This catalogue is really a valuable reference work, an index to some of the most valuable technical papers ever published. We feel certain that many of our readers are unfamiliar with the sale of the back numbers of our SUPPLEMENT. These papers usually furnish information of the utmost value, at small cost.

A POSTAGE stamp exhibition, which is said to be the most scientific and elaborate ever gotten up, is now open in London. The exhibits are valued at $1,250,000.

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DRILL IN THE UNITED STATES NAVY.

In the frequent discussions which take place upon the question of the personnel of modern navies it is a common complaint that the present day man-of-war's man is not the thoroughgoing seaman that his forerunner was in the days of the sailing frigate and the three-decker. The complaint is urged not merely against the navy, but it includes the whole merchant marine. It is claimed that, with the entrance of steam and the passing of masts and sails, the able seaman lost his occupation, developing into a mere laborer, for whose round of daily tasks there was needed neither skill nor intelligence.

Now, although there is a small measure of truth in the statement as applied to the navy and a large measure of truth in it as concerning the merchant marine, the case is not quite so strong as many pessimistic writers would have us believe. Of course it cannot be denied that, as far as pure seamanship in the popular sense of the term is concerned, there was more of it to be learned in early days aboard a Bon Homme Richard or a Constitution than there is to-day upon a Brooklyn or an Indiana. To keep an old three-decker up to concert pitch—and with rare exceptions they were maintained in splendid condition both below and aloft—was a task that gave its crew hard work and plenty of it, besides requiring a considerable amount of technical knowledge and skill.

The coming of the age of steam has practically dismasted the battleship and has very largely turned the sailor into a mechanic. It has also undoubtedly lightened the daily labors of the crew, and this to such an extent that it has become necessary to institute special drilling exercises with a view to keeping the men in good physical condition. Not that the daily drill is a new institution, but there is a tendency among naval officers to give it a more prominent place in the daily routine and bestow upon it more thought and care than was formerly the case.

At the same time it must be admitted that the change from sail to steam, from wooden hulls to hulls of steel, from cast iron smoothbores to rifled breechloaders, has brought on board certain new duties which to a certain extent compensate for those which have passed away.

Any visitor who may chance to be aboard a United States warship at 9:30 in the morning or at 5 or 5:30 in the afternoon will see the crew going through a series of arm and leg exercises and ending it usually by a run on the double in single file around the deck. This is what is known as the "setting up" drill, and it is in universal use throughout the navy. The drill is carried out as laid down in the manual of infantry tactics, and, in the case of most ships, lasts about ten minutes, though in some cases it is extended to ten or twenty minutes. The movements are similar to those used in any course of calisthenics, and, as its name implies, it is intended to straighten up the men, expand the chest, square the shoulders and give them that erect carriage and alert movement which are supposed to distinguish the naval and military man from the civilian. The setting up drill takes place regularly at the hours named on every day of the week.

There are a number of other drills which differ from the setting up drill in the fact that they not merely give muscular development and erect carriage to the men, but have to do with the working of the ship and the guns. These are practiced in their order on different days, so that the whole course is gone through once in a week. Among others may be mentioned the gun drill, the rifle drill, which is similar to that carried out in the army, the pistol drill, fencing or the broadsword drill, the artillery drill, practiced aboard those ships which carry field guns, in which is included the landing drill, the collision drill, in which the men are trained in the use of the collision mats, etc., the "abandon ship" drill, in which the crew are taught how to leave a sinking ship without disorder or panic. In addition to these the crew are drilled in the arming and equipping of the boats, and also receive sailing and rowing instructions.

In all this instruction there is, of course, a fair amount of exercise, for the various operations are carried out exactly as they would be in actual service. Thus, in the gun drill, whether it be at a small 6-pounder rapid fire gun or in the turret of a 60-ton gun, the detailed movements of opening the breech, raising the ammunition through the hoists—dummy shell and powder charge being used—ramming home the charge and sighting and firing are gone through with precision, every man being in his proper place and station.

As we before stated, however, there are many naval officers who consider that more time and attention could profitably be given to development drill, that is, to drills which are intended to develop the chest and muscles and give to the seaman something of that old time agility for which he was distinguished in the days of the sailing ship. Accordingly, in some few of the ships the setting up drill has been varied and extended according to the ideas of the officers on board, and in every case the changes have been in the direction of making the drill more interesting to the men and more gymnastic in its effects. By the courtesy of Lieut. W. R. Rush, of the U. S. S. Brooklyn, we are enabled to present our readers with instantaneous views of the various movements of a drill which he has introduced on that fine ship. Of the sixteen movements shown, one-half are done without arms and the remainder with the rifle. It should be mentioned that there are altogether eighteen points in this drill, or two more than we have shown, and the whole set is gone through in regular rhythm and time. The movements are so well chosen that there is not a member or muscle of the body that is not exercised, the arms, legs, hips, shoulders and chest being successively and specially brought into play by the different movements.

On the battleship Maine, Captain Sigsbee, who is an ardent advocate of the adoption of a more extended system of drilling in the navy, is having the men taught the full Development Drill as carried out at the United States Naval Training Station, Coasters' Harbor Island. This drill, which began with the Swedish movement, has been tried on various occasions, and Admiral Bunce, when some years ago in charge of the training station at Newport, investigated the system, and had it standardized for use on shipboard. When Captain Sigsbee was in charge of the training ship Portsmouth he had the system taught in its entirety, this being the first time that it was adopted in any ship afloat.

The value of this drill when it is thoroughly carried out lies in the fact that it is very precise, and the rhythm of the movements is maintained in such a way that it rivets the attention of the men to the drill-master. Moreover, by its indirect effect the Development Drill is a great assistance to the other drills on board ship. The drill is divided into five sections: Free exercises, leg work, body work, arm work and extension exercises. No apparatus is necessary, though at the training station each man uses a pair of light wooden dumbbells.

There are usually from two to four counts to one movement, and the counts are repeated over rapidly so as to insure a total series of sixteen to twenty-four counts at one time. To give a clear idea of the method we quote from the manual the following movement, known as the vertical push:

"Count 1. Jump the feet apart, at the same time swinging the dumbbells between them.

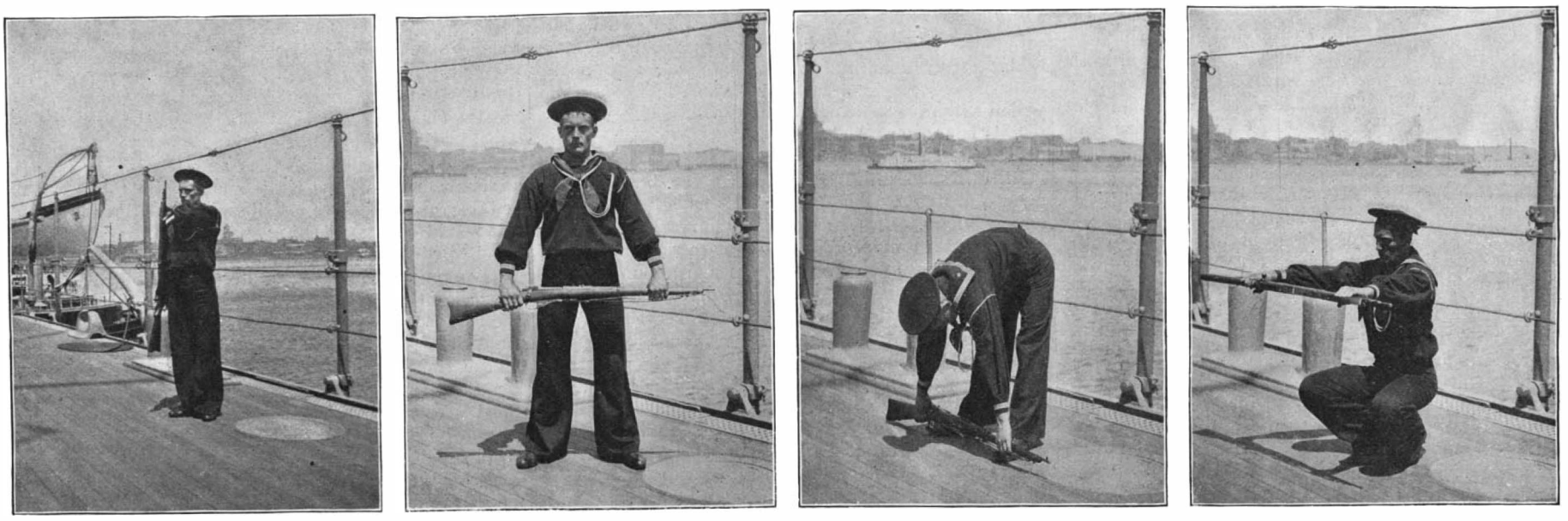
"Count 2. Jump feet together, at the same time bring bells to top of shoulders, elbows back and on the same level as the shoulders.

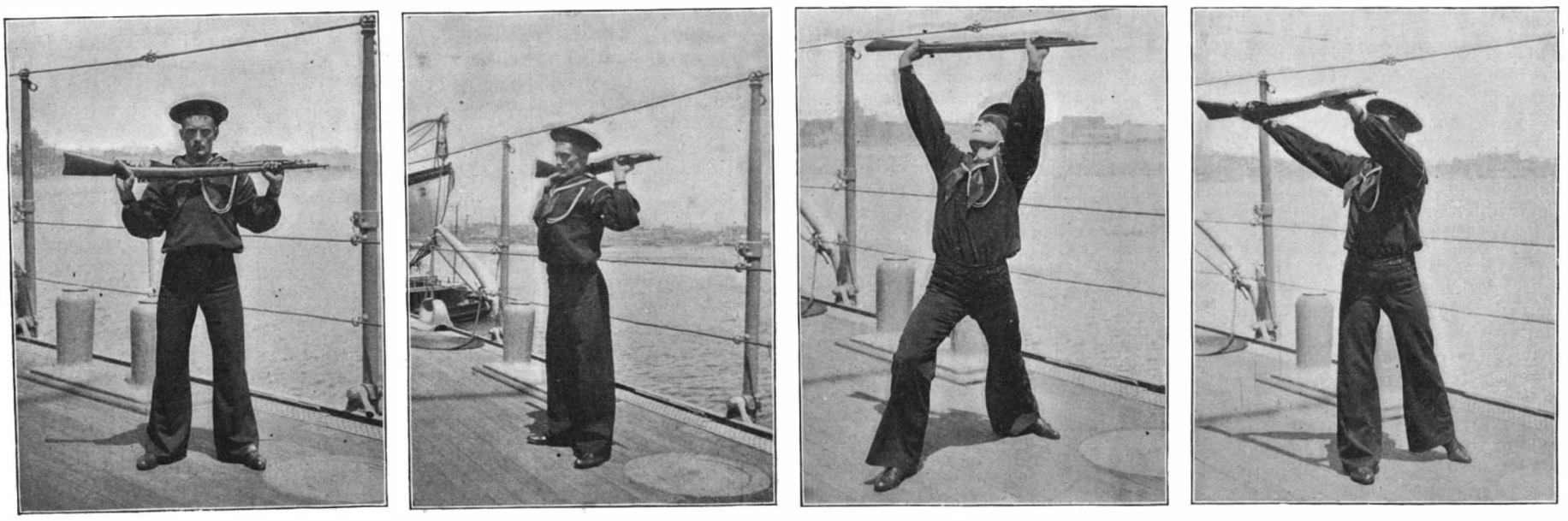
"Count 3. Push to a high vertical, striking bells together, palms in, elbows stiff and upper arms close to ears.

"Count 4. Back to position in count 2."

This movement acts on the inside of thighs, side walls of chest and top of shoulders.

In conclusion it should be noted that these exercises,





DRILL ON THE UNITED STATES ARMORED CRUISER BROOKLYN—WITH ARMS.

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simple as they appear to an onlooker, really call for an astonishing amount of energy. Captain Sigsbee states that even a gymnast, if he were unused to the movements, would have to take a rest before he could go through the whole series as given in the Training Station Manual.

Causes of Sudden Death.

Roughly speaking, about one-half of the total number of cases of sudden death from natural causes in adults is, more or less, due to heart disease, which has existed for some time, and in which no further change is in progress at the time of death—such as valvular disease, angina, fatty heart, and sclerosis of the cardiac muscle from chronic myocarditis. In many cases concurrent lung or kidney disease complicates the statistics, such cases frequently being tabulated as deaths solely due to heart disease. Spontaneous rupture of the heart, mostly in men, may exceptionally occur; the left ventricle, often toward the front, is almost invariably the seat of the rupture. It is to be remembered that in traumatic rupture of the heart the right side, usually the auricle, suffers more frequently than the left in the proportion of about as 70 is to 54. Apoplexy and other cognate brain lesions rank second as natural causes of sudden death. It is to be noted that miliary aneurisms of the vessels of the brain, although most common in persons past middle life, occasionally occur in young people, even in children, and by bursting cause death from apoplexy. Chronic alcoholism, a potent factor among the causes of sudden death, is frequently associated with rapidly terminating heart and brain disease.

Asphyxia, a not unfrequent cause, may be due to œdema of the glottis, membranous deposit in the trachea, pressure of a neoplasm on the trachea, spasm of the vocal cords, pulmonary embolism, air embolism, rupture of a vessel or of an aneurism into the air passages, asthma, whooping cough, pneumo and hæmo thorax, pleuritic effusion, and epilepsy. The rupture of a gastric or intestinal ulcer, of an aneurism, of a varicose vein, of the surroundings of an ectopic gestation, the formation of a peri-uterine hæmatocele, may severally prove quickly fatal. Nephritis (uræmia and apoplexy), diabetes, exophthalmic goiter, and Addison's disease may also terminate with unexpected rapidity. Hemorrhage into the pancreas occasionally causes sudden death, apparently from the impression produced on the contiguous nerve centers. It is most common in males over forty years of age who may up to the occurrence of the hemorrhage to all appearances be in perfect health. Obesity, the habitual use of alcohol, and the presence of heart disease appear in many of the cases to be predisposing causes. Koetschau, however, observed hemorrhage into the pancreas in a woman—an alcoholic—in her twenty-fourth year. Occasionally it occurs in spare people who are free from obvious disease and who are abstemious as regards alcohol. The sufferer may die within half an hour after the occurrence of the hemorrhage, or he may survive for twenty-four or even thirty-six hours. Draper records five cases between the ages of twenty-six and fifty-five years, of which three were men and two women. Fitz tabulated sixteen cases, of which eleven were males between thirty-one and seventy years of age, and five were females between twenty-six and forty-seven years.

Sudden death has in instances followed spontaneous rupture of an enlarged spleen, the result of tropical malarial influences, the individual immediately before rupture being to all intents and purposes quite well. Pellereaux gives the history of thirteen cases of rupture of the enlarged spleen; in five the rupture was spontaneous, and in the remainder it was due to apparently inadequate causes, such as a simple fall in the street. It is to be borne in mind that when the spleen is thus enlarged a mere pat with the palm of the hand may determine rupture and consequent speedy death, which, in the absence of a knowledge of the experience of others, might readily be assumed to be the result of criminal violence.

It is to be remembered that some of the above named diseases may exist without giving rise to any symptoms until the fatal moment arrives; this applies with special force to diseases which have a prolonged course, during which, as a rule, symptoms indicative of the disease declare themselves. Such a disease is gastric ulcer. I have seen more than one case in which, until the fatal rupture occurred, absolutely no symptoms were experienced, not even such as might have been attributed to simple dyspepsia; in one such instance a second ulcer was present in the walls of the stomach in addition to the one that ruptured and caused death, and yet until perforation occurred the patient never felt any abnormal sensation whatever.—J. D. Mann, M.D., in London Lancet.

Astronomical Weather Predictions.

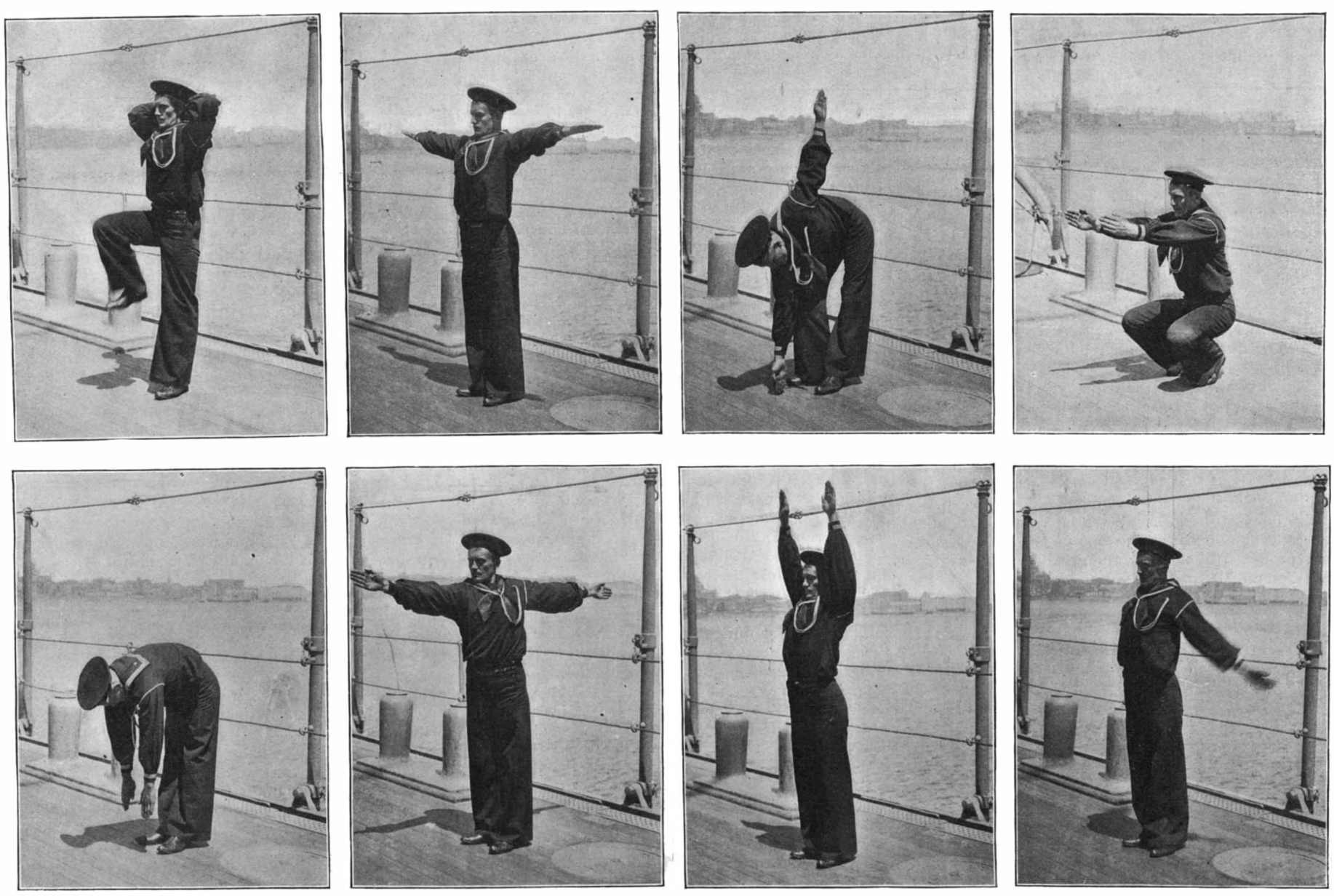
Mr. A. J. Devoe, predicating his predictions on astronomical causes, believes that a cyclone will occur from the 10th to the 15th of August, the severest part being along the eastern coast of England and Scotland and may extend over the North Sea.

A second cyclone will be due between August 25 and 30 off the coast of North Carolina and move northward, while in Ohio, between August 25 and 28, there is to be a tornado. A similar storm should occur over the southeastern part of Europe, followed by unusual floods.

Government's Costly Archives.

Those persons who are interested in the archives of the government, but do not know what they are, are told by a correspondent of the New York Times that they include some very costly as well as interesting papers. The papers of George Washington, in 336 volumes, cost $45,000. James Madison's papers, in 75 volumes, were purchased for $25,000. The papers of Thomas Jefferson, in 137 volumes, were acquired at a cost of $20,000, besides $6,000 appropriated for their publication. Sixty-five volumes of Alexander Hamilton's papers, bought for $20,000, were also published at a cost of $6,000. The papers of James Monroe, consisting of 22 volumes, were bought for $20,000. Benjamin Franklin's papers, in 32 volumes, were bought in 1882 at a cost of $35,000.

Although the government paid $165,000 for these papers, they are regarded as priceless. Still, they are not so valuable as the papers of the Continental Congress, which are included in the collection of the Department of State. These and other historical papers of great and fascinating interest to the student of history are kept in part for the study of the historians of the future, and are accessible under proper guards and restraints to all who believe they have occasion to consult them.



DRILL ON THE UNITED STATES ARMORED CRUISER BROOKLYN—WITHOUT ARMS.

Ribbon Books for the Blind.

Prof. D. Wallace McGill, at a convention of the Missouri National College Association of the Blind, held in St. Louis some time ago, suggested the idea of an attachment to a typesetting machine for perforating simultaneously a ribbon of paper with the same letters set up in type. These ribbons are then to be bound in book form, and by a transforming instrument passing over the perforations, the letters can be easily read by a blind person.

It is a better plan, he thinks, than raised letters, as the book leaves would take no more space than an ordinary printed book, while the expense would be trifling. As a rule, however, depressions are not as easily read by the blind as raised letters.

It would seem as if an attachment to a typesetting machine of this character could be easily invented and worked out. The idea of thus putting all the best literature into readable shape for the blind is certainly worthy of study by our brightest inventors and leading educators.

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The Drinking of Water.

A physician in the Western Bottler states the necessity which exists for the presence of water in the diet and in the tissues of the body. The fact is well known, but the doctor writer has clearly given the reason for the beneficial action of water on the different organs. The article is of unusual interest and many persons will be the better from adopting its suggestions. Although water is not a food in the sense of directly contributing to the production of force or heat, it is yet a food in the sense that, without its presence in the body, all vital action must come to a standstill, as no change is possible in its absence. Our tissues contain an indispensable proportion of water; we are constantly losing large quantities by breathing, by perspiration and the various excretions, and, as just hinted, its presence is required for the occurrence of those various chemical changes by which we live and move and have our being. This being so, its value as an article of food may be taken as granted, and we may consider more particularly its action and uses when taken not as a food, but as a means to preserve health or to ward off or remove disease.

The effects produced by the drinking of water vary with the manner in which it is drunk. If, for instance, a pint of cold water be swallowed as a large draught, or if it be taken in two portions with a short interval between, certain definite effects follow—effects which differ from those which would have resulted from the same quantity taken by sipping.

EFFECTS OF SIPPING.

Sipping is a powerful stimulant to the circulation—a thing which ordinary drinking is not. During the act of sipping the action of the nerve which slows the beats of the heart is abolished, and as a consequence that organ contracts much more rapidly, the pulse beats more quickly and the circulation in various parts of the body is increased. In addition to this, we also find that the pressure under which the bile is secreted is raised by the sipping of fluids—a fact the importance of which we shall notice directly.

Many individuals may have been at times unpleasantly conscious of the fact that a glass of wine or beer sipped gets into the head much quicker than if drunk at a draught. They will now be in a position to understand why this is so; the explanation being that the temporary paralysis of the inhibitory nerve of the heart, and the increased stimulation of the circulation, favor the rapid absorption of the alcohol and the production of its consequent effects. The same thing occurs if the fluid be sucked through a straw, the effects of sipping and sucking being identical.

Swallowing in the usual way has not the stimulant effects of sipping, but it has one or two special effects not produced by sipping, the use of which we shall mention a little later.

EFFECTS OF DRINKING.

The effects of drinking cold water are these: If, say, a pint of cold water is swallowed straightaway, the temperature of the body is slightly lowered—about one degree Fahrenheit—the pulse rate is somewhat decreased (not greatly increased, as by sipping), and the respirations are slightly accelerated. The blood vessels in the lining membrane of the stomach are at first contracted; they very soon, however, rapidly dilate, the blood flow in them is increased, and the secretion of gastric juice is stimulated.

DRINKING WARM WATER.

There are, on the other hand, many persons who find that these effects are brought about better if they take warm water instead of cold, although at first sight it may appear somewhat strange that like effects are produced by both hot and cold water. The explanation is simple. The warm water acts exactly as does the cold, only without the previous contraction—its action being to at once dilate the vessels after its reception by the stomach. The practice of drinking

AT MEALS

large quantities of liquid is bad; but small quantities may be taken without harm, although undoubtedly it is wiser to drink either before or after the meal, if we cannot limit our consumption of fluids to a distinctly small amount. Whenever a meal is particularly rich in fatty material, it is a good plan to drink some time after the meal, as in this way the digestion of fat in the intestines is aided.

ITS PURGATIVE ACTION.

That water possesses a purgative action is a thing well known to many people. This particular effect is due to its power of stimulating the secretion of bile and also of increasing the peristaltic action of the intestines; bile being a natural purgative and increased peristalsis being the enemy of constipation and sluggish bowel action. If plain water be taken, its purgative effects are best produced by its being cold; if natural mineral waters are taken, they should be mixed with a small quantity of hot water so as to be at about the same temperature as the stomach. Warm water is more readily absorbed than cold, and moderate quantities than large ones, absorption being retarded if large quantities of either warm or cold water are taken at once. The best time to obtain the purgative effects of water is on rising in the morning. A glass of cold water taken on rising is often quite sufficient to procure an easy movement of the bowels, and this result will be the more certain if the water be sipped while dressing. This sipping operation should not, however, be hurried, but should be gone through slowly and at short intervals.

EFFECTS OF FREE DRINKING.

Free drinking of water produces effects upon the kidneys and tissues of the body generally no less important than those we have been considering. There is every reason to believe, from observations, the nature of which it is unnecessary for me to state, that the increased excretion of urine which follows the drinking of plenty of water not only clears the body of many poisonous and effete substances, but is itself an index of changes within the body which have for their end the enhanced health and comfort of the individual.

Much harmful material which has often to answer for malaise, want of energy, and various aches and pains, is undoubtedly washed out of the tissues and excreted by the kidneys as the result of free water drinking. This alone is decidedly beneficial, but, in addition, the drinking of much water causes the tissues to be changed, with the result that vitality is increased and strength augmented. So great in this direction are the effects of cold water, that persons leading sedentary lives may often obtain, by drinking plenty of water, much of the feeling of health and exhilaration which results from taking exercise—a fact not difficult of belief when we remember that a glass of cold water, slowly sipped, will produce greater acceleration of the pulse for a time than will a glass of wine or spirits taken at a draught. In this connection, too, it may not be out of place to mention the fact that sipping cold water will often

ALLAY THE CRAVING FOR ALCOHOL

in those who have been in the habit of taking too much of it, and who may be endeavoring to reform, the effect being probably due to the stimulant action of the sipping.

AN IMPORTANT DECISION.

A decision of much importance, owing to the magnitude of the interests affected and the questions of law involved, was handed down by the United States Circuit Court of Appeals for the Second Circuit on the 21st ult. in the suit brought by the Thomson-Houston Electric Company against the Hoosic Railway Company to restrain the infringement of letters patent No. 495,443, granted April 11, 1893, to the administrators of Charles J. Van Depoele for traveling contact for electric railways. This is the well-known trolley patent which its owners claimed covered every practicable form of under-running trolley, and the case was before the court on an appeal from an order of the Circuit Court granting a preliminary injunction against the defendant. The opinion, written by Judge Wallace, holds, upon the authority of Miller v. Manufacturing Company (151 U. S. 198), that the claims sued upon are invalid, because the same invention was patented by Mr. Van Depoele in patent No. 424,695, dated April 1, 1890, and the order of the Circuit Court granting the preliminary injunction was reversed.

Both of these patents originated in a single application filed by Van Depoele March 12, 1887. The application was subsequently divided, and patent No. 424,695, containing thirty-five claims, was issued on one of the divisional applications on April 1, 1890. The other divisional application was delayed in its progress through the Patent Office by an interference, and the patent in suit, containing sixteen claims, was issued thereon April 11, 1893.

The features covered by the claims in controversy are all shown in the accompanying drawing, which is identical in both patents.

In each patent there are shown a hinged trolley arm pivotally supported on a post on the car roof, the arm carrying the contact wheel and having at its lower end a spring with a suspended weight.

It will be observed that the construction, arrangement and necessary operation of the trolley, the trolley arm, the post on the car, the means of securing and supporting the arm on the post, the spring and weight, are exactly the same in both patents, not only in construction and arrangement, but in necessary operation.

The earlier patent purports to claim only a certain switch plate, switching devices, and certain details "which are not essential features of the contact device itself, considered without reference to the switch," and disclaimed the contact device which forms the subject of application No. 230,649.

If the claims of this earlier patent had been clearly limited to the details which were not "essential features of the contact device itself," or to the switch plate, the right of the inventor to claim broadly in his later patent the essential features of the contact device would have been unquestioned, but the claims were not all so limited. Among the claims of the earlier patent are the following among others that are not limited in the respects mentioned:

"15. In an electric railway, the combination of a car, a conductor suspended above the line of travel of the car, a contact carrying arm pivotally supported on top of the car and provided at its outer end with a contact roller engaging the under side of the suspended conductor, and a weighted spring at or near the inner end of the arm for maintaining said upward contact, substantially as described. . . .

"32. In an electric railway, the combination, with an overhead conductor and a vehicle, of a trailing contact arm guided at its outer end by the overhead conductor, and movable laterally relatively to the vehicle, but having a normal centralizing tendency by means of a spring or weight.

"33. In an electric railway, the combination, with an overhead conductor and a vehicle, of an intermediate contact device consisting of an upwardly pressed trailing arm having a grooved contact wheel at its outer end by which it is guided by the conductor, the said arm being free to swing laterally relatively to the vehicle, but tending to remain in its normal central position by means of a spring or weight."

The presence of these claims in the earlier patent alone goes far to justify the decision of Judge Wallace.

The claims of the patent in suit of which infringement was charged were five in number, of which we give two examples, as follows:

"7. In an electric railway, the combination of a car, a conductor suspended above the line of travel of the car, a swinging arm supported on top of the car, a contact device carried by one extremity of the arm and held thereby in contact with the under side of the electric conductor, and a tension device at or near the other end of the swinging arm for maintaining said upward contact, substantially as described.

"8. In an electric railway, the combination of a car, a conductor suspended above the line of travel of the car, an arm pivotally supported on top of the car and provided at its outer end with a contact engaging the under side of the suspended conductor, and a tension spring at or near the inner end of the arm for maintaining said upward pressure contact, substantially as described. . . .

"12. In an electric railway, the combination with a car of a post extending upward therefrom and carrying a suitable bearing, an arm or lever carrying at its outer end a suitable contact roller and pivotally supported in said bearing, and provided at its inner end with a tension spring for pressing the outer end of the lever carrying the contact wheel upward against a suitable suspended conductor, substantially as described."

After holding that the court should undertake to examine and "in a sense to review collaterally" the decision in the previous suit on the same patent, brought in the District of Connecticut, against the Winchester Avenue Railway Company, in which Judge Townsend, holding that the earlier patent did not claim the same invention, sustained the patent at final hearing, from which decision no appeal was taken, Judge Wallace says:

"The operative parts of the contact device are described in identical language in each patent, and the language of the claims aptly describes these parts. While the function of the tension device is stated with more particularity in the earlier patent, the description does not contain a word or hint by which its characteristics can be differentiated from those of the tension device of the later patent. . . . In the later patent, as well as in the earlier, the tension device is a spring and weight, so arranged as to 'permit lateral motion by the arm,' lateral motion being afforded because, as the specification of each patent states, 'the arm is hinged, and should, in most instances, be pivoted to the top of the post, although a reasonable amount of looseness in the hinged joint will answer the purpose of the pivot.' In the earlier as well as in the latter patent, the spring and weight 'are so arranged as to constantly tend to restore the arm to its normal central position,' and thus 'assist it to partake of the lateral movement of the car,' because this is the necessary action of the spring and weight at the short end of the arm. As described in each specification, the tension device is a spring, which is held in its proper place by the weight. . . .

"Of course, if the claims of the earlier patent do not specify such a tension device as is described and claimed in the later, but specify one which embodies only a subordinate improvement upon it, the patents are not for the same invention. . . . Inasmuch as the only tension device, or means for imparting upward pressure to a trolley arm, described in the specification of the later patent, is that which consists of the weight and spring as it is described in the earlier patent, the verbal differences in defining its functions in the several claims are of no significance. The thing itself is the same in the claims of both patents. The spring which tends to retain the arm in its normal position is exactly the same spring and no other than that which maintains upward

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contact or pressure between the contact device and the suspended conductor. If any importance is to be attached to these verbal differences, the earlier patent claims a tension device, the chief function of which is to exert a normal centralizing tendency upon the arm, but which of necessity must maintain the upward pressure, while the later patent claims one, the chief function of which is to maintain upward pressure, but must of necessity also exert the normal centralizing tendency. If there had been in the description anything by which it could be ascertained which of the structural features exercises one function and which the other, a different case would be presented. The matter sought to be covered by the second patent is inseparably involved in the matter embraced in the former patent, and this, under the authorities, renders the second patent void.

"It is manifest that both patents are intended to, and do, secure to the patentee the same general inventions, . . . although the earlier patent also covers improvements in the switches, and subordinate combinations between these devices and the elements of the principal combination. . . .

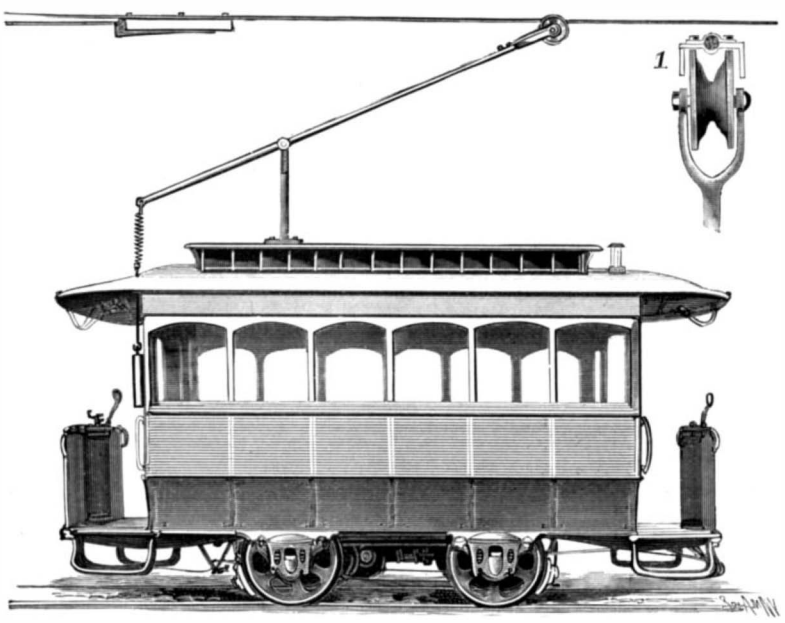
"We are of the opinion that claim 15 of the earlier patent describes and embraces everything of substance which is covered by claim 7 of the patent in suit.

"We are also of opinion that claim 33 of the earlier patent specifies essentially the same combinations embraced in claims 8, 12 and 16 of the patent in suit, and that the 'spring or weight' of claim 33 is the same thing as the 'tension spring' of claims 8, 12 and 16, the 'weight' being only an alternative element."

As the facts which were before the court on this appeal must necessarily be the same on final hearing, and as this decision does not extend the rule laid down in the much cited and much abused decision of the Supreme Court in Miller v. Manufacturing Company, it seems to be generally believed that this decision will be followed not only in this circuit, but by the Supreme Court, if the controversy should be carried there.

The patent has been in constant litigation almost since the day of its issue, and injunctions have, on the strength of Judge Townsend's decision, been granted against numerous roads using the under-running trolley, and also against manufacturers who have furnished stands and other parts used in trolley road equipment, on the theory of contributory infringement.

As late as May 17 last, the Circuit Court of Appeals for the Sixth Circuit affirmed an order of the Circuit Court for the Northern District of Ohio, granting a preliminary injunction restraining the Ohio Brass Company, manufacturers of trolley road equipment, from infringing the claims now held to be invalid. Precisely the same question was presented to that court, but the court, while evidently entertaining grave doubts as to the correctness of Judge Townsend's opinion, held that the decision of a circuit court of another circuit sustaining the patent should be of controlling weight in the court below, and that on appeal the case should be reviewed merely to ascertain whether there had been any abuse of discretion in the circuit court. The variance between the two decisions was simply as to whether Judge Townsend's decision should be examined collaterally. Judge Taft, speaking for the Ohio court, thought it should not, and Judge Wallace thought it should. The two decisions on the principal points at issue are therefore not inharmonious.



VAN DEPOELE UNDER-RUNNING TROLLEY.

Dangerous Inks.

The London Lancet calls attention to the serious injuries which sometimes result from an apparently trifling scratch or puncture made with the pen. The chemical constituents of the ink which is introduced by the pen into the wound are not capable of producing septicemia, but microscopic examination proves that the ill effects are due to the liability of ink to contain pathogenic bacteria. Dr. Marpmann, of Leipsic, has recently published the results of the microscopic examination of sixty-seven samples of ink used in schools. Most of them were made with gall nuts, and contained saprophytes, bacteria, and micrococci. Nigrosin ink, taken from a freshly opened bottle, was found to contain both saprophytes and bacteria. Red and blue ink also yielded numerous bacteria. In two instances Dr. Marpmann succeeded in cultivating from nigrosin ink a bacillus which proved fatal to mice within four days. This ink had stood in an open bottle for three months, and the inference to be drawn from the inquiry is that ink used in schools should always be kept covered when not in use. The practice of moistening the pen with the tongue is likewise a dangerous one.

The Bertillon System for Identifying Criminals.

H. P. Flower, Mayor of New Orleans, who has been to Paris to study the Bertillon system for the identification of criminals, has just returned. He said that, through the kindness of M. Bertillon, he had had an opportunity to master the system, which will be adopted by the Police Department of New Orleans. The mayor will teach the system to the police captains. The system was described in the SCIENTIFIC AMERICAN for April 3, 1897.

A NEW METHOD OF BUILDING SUBMERGED FOUNDATIONS.

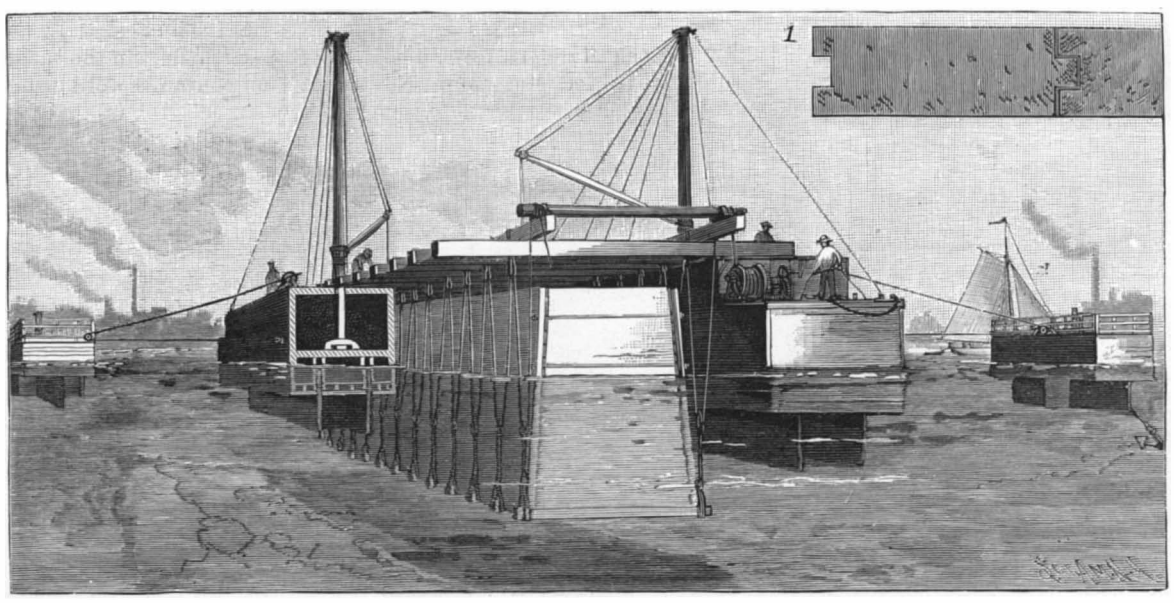
We recently had an opportunity to inspect a full size working model of the proposed system of building submerged foundations which is shown in the accompanying illustrations. Its author, Mr. D. Jordan, a contractor of 800 Fulton Street, San Francisco, Cal., has for many years been engaged in the construction of various kinds of pier and bulkhead work, and the present method has been devised with a view to expediting the construction and lessening the cost of such work on all sites which offer a suitable foundation.

There are at present in use two or three leading systems of building such work. The first and most common is the pneumatic process, in which a caisson containing a working chamber is sunk to bed rock or other sufficiently firm material, the caisson being filled in with concrete and the masonry pier built upon it to the required height. In this system the caisson is surrounded by a cofferdam which permits the masonry to be laid dry until it is well above high water, the weight of the masonry serving to sink the caisson. A common method is to sink an open cofferdam, pump out the water, and excavate the material with dredges. Another plan is to drive piling, cut it off just above the river bottom, sink a grillage of 12 by 12 timbers upon it, building the masonry pier upon the grillage to the required height. Another system, frequently used in the construction of breakwaters, is to build massive blocks of concrete upon a suitable bed at low tide, and transport them suspended beneath a scow at high tide to the site of the work.

The system herewith illustrated, and which is protected by patents, differs entirely from the foregoing and possesses some points of practical advantage which will commend themselves to the engineer. Unlike the others, the whole of the sea wall, pier or bulkhead is built upon a platform suspended above the level of the water, and lowered as it is built until it rests upon the bottom of the river or harbor. In this way the use of the cofferdam, the pneumatic system, or of piling is unnecessary, and, judged on the face of it, the system should be considerably cheaper than any of those above mentioned. Its range of usefulness would, of course, be limited to those sites which offer a fairly homogeneous bottom, free from large bowlders or projecting rock, and capable of being dredged to a true and level surface.

The illustration speaks for itself and needs but little explanation. Two large oblong barges are moored parallel to each other and at a little greater distance apart than the width of the foundation. Massive transverse girders, spaced a few feet apart, are laid across from roof to roof of the barges. Below them and just above the surface of the water is suspended a platform which is carried upon a series of girders spaced the same distance apart as the overhead girders above mentioned. A series of steel sheaves are suspended from two longitudinal stringers laid on the overhead girders, and a similar series is attached by steel straps to the girders of the platform. A wire cable is rove through each set of sheaves and its ends are wound on two winches located at the ends of the barge. The masonry or concrete wall or pier is then built up on the platform, which is lowered as the building goes on until it rests on the bottom, which has already been dredged out for it. To insure that the rate of lowering shall be even on each side, the cables after leaving the drums are given a double turn around the heavy roller, shown in the engraving, before they pass to the sheaves. To give the barges lateral steadiness they are each provided with a pair of deep centerboards, and they are secured from fore-and-aft movement by heavy anchors. They are also secured by cables to auxiliary anchor barges, which are themselves provided with longitudinal and transverse centerboards, and are anchored in three directions as shown. The cables which connect the pier barges to the anchorage barges pass from the side of the former through sheaves on the latter and are carried back to the pier barge and drawn taut with a windlass.

It is claimed by Mr. Jordan that by this system he can build a sea wall or bulkhead in lengths with a tongued and grooved joint at the ends (Fig. 1) up to the water level, and from this point up construct them of continuous masonry. In the case of bridge piers which were too massive to be built on a single platform, the pier would be built in two halves up to the water line, and continued up to the desired height as a single block of masonry.



SUSPENSION METHOD OF BUILDING SUBMERGED FOUNDATIONS.

The system is also well adapted to the construction of dry docks. In such structures the blocks of concrete are packed watertight at the end joints. The outer wall surrounding the dock is first built, a temporary cofferdam being constructed at the entrance, then the water is pumped out and the inner concrete floor and abutting steps are made. Another suggestion of its use is the building of a harbor of refuge. The sea wall is first made quite high, and two hundred feet to the rear is a lower wall, the space between the two being filled in with sand, while the surface is arranged in a series of steps adapted for use in supporting artillery and protecting breastworks in case of war. Mr. Jordan's temporary address is Hotel Empire, Sixty-third Street and Boulevard, New York City, from whom further information may be obtained.

A MONUMENT to the memory of Daguerre has been erected by public subscription at Bry-sur-Marne, and was inaugurated on Sunday, June 27. The memorial is a bronze bust on a stone pedestal, and is the work of Madam Bloch. At the close of the ceremony wreaths were placed upon Daguerre's grave.

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RECENTLY PATENTED INVENTIONS.

Railway Appliances.

ROLLER BEARING FOR CAR JOURNALS.—William J. Tripp, New York City. This bearing comprises collars held on the journal and a series of rings forming ball races with the collars, the outermost ring being held against movement while the other rings are free to move toward the outer ring; balls are held in the races and sectional rings carry pivots for the balls to turn on. An adjustable dust cap is held on the inner end of the box and engaging the innermost ring, to adjust the several rings in their relation to each other and to the balls.

DUMPING CAR.—John A. Hughes, Honolulu, Hawaii. A car which may be employed in any railway work, but which has been devised by the inventor mainly for use on sugar plantations, to transport cane to the mill, etc., is the subject of this patent, the principal object being the discharging of the car by power, saving the labor of a number of men. The platform is mounted to rock laterally in either direction on the truck frame, and at each side, somewhat inward from the edge, the platform is provided with two hinge sections. Attached to each side of the rocking platform are two hooks adapted to be engaged by a lifting power, as by means of a wire rope from a hoisting drum. The stakes are, by a special arrangement, easily removed.

Electrical.

FUSE HOLDER AND CUT OUT.—Harry A. Lewis, Norristown, Pa. The invention covered by this patent comprises an improvement on a former similar patented invention of the same inventor, for a device to be arranged in the line wire to relieve the building or other place to which the wire leads from the danger of a strong or excessively charged current, by breaking the current and diverting the electric fluid from the building. A circuit breaker has a spring-pressed lever adapted to make contact with an arm connected with the line wire, while another lever has a shoulder adapted to lock the first lever in contact position, and a thermostat having a fixed tube at one end presses at its other end on the second lever, a coil of wire forming part of the line extending into the tube.

PROPELLING AND STEERING BARGES.—Alba D. Archibald, Covington, Ky. To supply a positive steering force at the head of a tow, under the direct and immediate control of the pilot on the propelling steamer, this invention provides for equipping the propeller with a dynamo electric machine to be connected with one or more steering and propelling craft on each side of the fleet of barges near the front, and connected to and flanking the fleet. The steering craft are each equipped with an electric motor and a propelling screw driven thereby, and the motors are connected by movable circuit wires passing rearwardly over the barges to the propeller, to suitable switches and rheostats in the pilot house, enabling the entire power of the dynamo to be used to push or pull the head of the fleet to the right or left.

Bicycles, Etc.

TIRE.—William D. Snow, New Milford, N. J. A tire which changes automatically from a pneumatic to a cushion tire, in case of puncture, has been devised by this inventor. Resting in the usual rim is a solid cushion portion, oval in cross section, and from each side edge of this portion projects a resilient lug or flange to which is attached by cement or other means a flexible pneumatic portion, adapted to be distended by forcing air into the tire, the side flanges then forming part of the distended portion of the tire. In case of a puncture, the outer portion collapses and is brought down by reversed position of the side flanges into contact with the cushion portion, forming a cushion tire.

BRAKE.—Frank J. Coombs, Columbia Falls, Montana. This invention is for a brake mechanism in connection with the pedal shaft and sprocket wheel, the brake being set to braking position by back pressure on the pedals, the device also permitting the sprocket rim to rotate freely while the pedals are at rest. According to the improvement shoes are adapted to be forced against the interior of the sprocket rim, and the locking mechanism thereof is connected with a sliding block in a tubular handle bar, the hand grip having a cam portion engaging a cam portion of the block.

Agricultural.

PLANTER.—John S. Earhart and Charles Miller, Millersville, Ill. A triple row planter, devised by these inventors, is designed to increase the capacity of the ordinary planter about one-half. According to the improvement, the central or middle row planting mechanism is in a measure independent of the end planting mechanism, and the connection with the frame is such that the central planting mechanism may travel over uneven land without affecting the end planting devices. Means are also provided for regulating the depth of planting of the corn or other seed by the middle planter, and thereby indirectly controlling the depth at which the seed shall be deposited by the end planters.

STAKE FOR PLANTS OR FLOWERS.—Theron N. Parker, Brooklyn, N. Y. This device comprises a plurality of separable members, formed of wire, the lower ends of the legs having anchors of substantially triangular form. A lower main member is in the form of a frame at the top, with open loops which receive the legs of an upper member, while a still higher member may be connected with the stake by means of legs having hooked lower ends, the whole forming a readily adjustable, inexpensive framework, for the support of a plant of any required height, the members of the stake being readily separated and put together.

VEHICLE SEAT.—John Q. Black, Lone Rock, Wis. This invention provides a seat especially adapted for agricultural machinery, affording a seat designed to prevent the careening of the machine from throwing the operator from his seat. The improvement comprises a standard plate whose upper end is bent to form a table, and the seat has on its lower surface a longitudinal convex rib forming a rocker adapted to rest on the table, there being means whereby the seat proper is held within the lower surface of the rib bearing on the table so as to rock from side to side. The rider, with his feet on the foot board, is able to balance himself readily on the seat and is not liable to be fatigued on account of a cramped and uncomfortable position due t the tilting of the machine.

Mining, Etc.

TREATMENT OF GOLD AND SILVER ORES.—Joachim H. Burfeind, Salt Lake City, Utah. This invention is for a method of treating the cyanide product or precipitate containing the precious metals, instead of melting it in crucibles with fluxes, resulting in great loss from volatilization, and producing very impure bullion, while very impure products have to be shipped to refining works. The method consists in subjecting the product, with a suitable amount of water, to a current of sulphurous acid for about ten hours, the product being agitated by a stirrer; after settling and drawing off the liquor, strong sulphuric acid is applied, after which water is added and the mixture is boiled, the method being designed to produce bullion about 950 fine.

Miscellaneous.

CAN OPENER.—Walter A. Simond, Tilton, N. H. This is a device of the central pivot type, having but few parts and with a cutter which may be readily adjusted to open cans of different diameters, the cutter always opening the can top at the same distance from the side edge, whether the can be large or small. On the stem of the handle slides a yoke with guide spur engaging the outer side face of the can, and within the yoke is a hub carrying a disk cutter.

INKSTAND.—William L. Stewart, Wilmerding, Pa. This invention relates to a fountain type of inkstand, providing one that is simple and inexpensive, and in which the ink is not likely to evaporate. The fount is in the form of a bottle, and the original bottle containing the ink may be used therefor. The neck portion is extended into an ink cup and has a tubular stopper of cork or soft rubber, a valve closing the inner end of the opening through the stopper, while a stem extends from the valve through the opening in the stopper and is adapted to engage against the bottom of the ink cup, the valve closing when the bottle is lifted from the ink cup.

ELEVATOR CLUTCH AND BRAKE.—William Weismantel, New York City. To hold an elevator from dropping should the hoisting apparatus give way, and stop the elevator, in case of accident, before it attains a dangerous speed, this inventor employs a fixed rack attached to the building at one side of the elevator well, into which meshes a pinion journaled on the elevator cage, a ratchet wheel normally engaged by a pawl being connected to the pinion, but with means for disengaging it at will. A friction cylinder is also connected to the pinion in such manner as to provide means for lowering the elevator in case it becomes stopped between landings.

SAFE.—Wilhelm Kock, Cincinnati, O. In putting together the plates of a safe door, to render it difficult to detach them from each other with dynamite or by the use of tools, this inventor flanges the edges of the built-up plates at right angles to their body, and each pair is secured by bolts passing from the inside through the flanges of the inner plate and into the flange of the one next outside, while boltwork is secured by bolts screwing into flanges parallel with the front face of the door.

LIQUID VESSEL.—George W. Brown, Williamsburg, Pa. To retain the solid matter in a vessel from which the liquid is being poured, this inventor places inwardly projecting pins or lugs on the inner surface of the vessel near its top, and provides a skeleton cover adapted to be placed and to rotate between the lugs, such cover having its periphery broken at different points and having downwardly projecting flanges. Used in connection with a suitably adapted drinking vessel or tumbler, it will retain the ice, lemon skins, or other materials forming a portion of the liquid, or the device may be used in cooking vessels to retain solid matter while the liquid is being poured off.

AUTOMATIC PHOTOGRAPHIC APPARATUS.—Margarita Mann (administratrix of Charles Mann, deceased), New York City. Information to be had of N. Torres, 76 University Place, New York City. This patent is for an improvement on formerly patented coin-operated photographic apparatus, and comprises a camera, with lens, shutter, plate compartments, and gripping device below a plate receptacle and adapted to hold a plate in the field of the lens, while a motor operates the lens, shutter, the plate receptacle, and a bath carriage sliding beneath the camera, the carriage having compartments for a developing compound, a fixing compound, and a washing compound, there being also means for delivering the exposed plate from the bath carriage to the exterior of the apparatus. The invention provides for complete control of the time of exposure, and of development and delivery of the finished picture, the apparatus being operated by a motor, and being automatic in every movement when power is once applied.

PICTURE FRAME.—Gotthelf M. Seidel, Easthampton, Mass. A frame made of sheet metal or sheet material is provided by this invention, according to which the top, bottom and sides have pockets at their rear lower edges, the body of the frame being bent upon itself to form the front member of the pocket, while the rear member extends down parallel with the main portion of the frame, the pockets holding the picture, glass and backing. The frame is durable and inexpensive, and is designed to prevent dust or insects from getting into any of the parts or injuring the picture. Instead of the usual screw eyes for hanging, openings are made in the frame to receive hooks or like suspension devices.

VENTILATOR.—Thomas R. Harper, Wheeling, Mo. To carry off bad air from rooms and steam and odors from kitchens, according to this invention, a hollow foot piece or bowl is placed on the heater or range and adapted for simple connection with the smoke pipe, there being side openings in the foot piece and a draught tube extending upward from it to a spider connected with a funnel in the ceiling, a discharge tube leading from the funnel to a flue or other outlet. There is a coupling in the draught tube by which it may be lengthened or shortened to fit ceilings of different heights, and a valve for regulating the draught, and the invention covers various features providing for the ready and simple application of the improvement, including also its use in rooms where a fire is not usually kept.

VESSEL SCRAPER.—Nicholas Gilroy, New York City. To facilitate cleaning the interior of metal kettles, pots and similar vessels from rust, scale, etc., this scraper comprises a frame having a hand piece, and in which is held a beveled gear and pinion rotated by a crank to revolve a shaft on whose lower end is a spring head formed of spirally coiled wire, the spirals growing less in diameter toward the bottom. Loosely surrounding the head are looped rings, the head thus forming a cone-shaped basket, the rings acting as scrapers when the head is rotated by operating the crank, the head being moved around from place to place until the whole interior of the vessel has been cleaned.

LEMON JUICE EXTRACTOR.—Nicholas Gilroy, New York City. This device consists of two pivotally connected hand levers, one of which supports a juice cup in which is a dome-shaped support, while the other is connected with a concaved plunger having a scalloped edge by means of a spirally grooved stem extending through an opening in the lever, a spring surrounding the stem and bearing at one end on the lever and at the other end on the plunger. The plunger rotates as it moves down, so that the juice is extracted from the lemon by a rubbing motion designed to avoid taking out the bitter principle of the skin to mingle with the juice.

POCKET BOOK.—Bernhard Wilentshik, New York City. In addition to the usual functions of a pocket book, this invention provides a pocket book which is also adapted to carry a comb, looking glass and other articles. It has a change pocket and a front and back pocket with their mouths adjacent to each other, and both having hinge connections at their mouth ends with the opposite sides of the change pocket, while the adjacent faces of the pockets are provided with auxiliary pockets, loops, etc., for carrying various articles.

COAT HOLDER.—Robert J. Stuart, New Hamburg, N. Y. This is a device for holding a coat out in position to be put on by the wearer. It consists of two pairs of spring-held clamps whose fingers are adapted to engage the coat collar, one-half of each clamp set being fixed to the ends of a horizontal pipe and the other half to a bar lying in the pipe, while a lever is attached to the bar and connected by a cord with a treadle. The coat is secured in the clamping fingers by operating the treadle and is released in a similar manner, the device being fixed at the proper height.

FINGER NAIL TRIMMER.—William J. Sloan, East Liverpool, O. This is a device preferably combined with a lead pencil to form a rubber tip holder and a binding for the pencil, the pencil being used as a handle to facilitate using the trimmer in filing the nails. The nail trimmer consists of a metallic tube adapted to fit on the pencil and carry an eraser at its other end, the tube having elongated longitudinal depressions, the faces of which are provided with teeth to engage the finger nails.

BOTTLE AND CLOSING CAP.—Alfred Rodgers and George Peden, Johnstown, Pa. According to this invention, the bottle is made with a neck having tapering lower portion, above which is a shoulder and straight smaller portion, there being through the latter two opposite registering openings. A cap of glass fits down over the tapering portion of the neck, above which the cap is internally recessed, forming an inner peripheral shoulder. The cork being inserted in the neck to a point below the shoulder, a spring is passed through the registering openings in the sides of the neck, over the cork, and the cap is forced down over the inwardly pressed ends of the spring, when the cap and cork cannot be removed without breaking the cap.

JAR SEALING DEVICE.—John Schies, Anderson, Ind. The neck of the jar, according to this invention, has an outwardly and upwardly extending marginal flange, with an inner face affording an annular seat for the cover, whose upper side has circular ribs and oppositely arranged recesses adapted to receive portions of a T-shaped clamping device of spring material, whose outer extremities engage the neck of the jar. Between the flange of the cover and the flange of the jar a washer may be interposed, or the fastening clamp may be omitted and the trough around the cover edge be filled with cement.

BILLIARD CUE.—Romeo Ghezzi and Ferdinando Bertoncini, New York City. According to this invention, the tip is preferably made of leather, with an annular groove just below its side edges, where the base portion is adapted to be sufficiently compressed to pass within a notched flange of a ferrule or cap to be secured on the end of the stick, the base of the tip being hammered to form a rivet head on the under side of the flange and preventing the tip from turning in the ferrule. The latter has transverse notches under the tip surface, in which are placed threads whose ends extend beyond the ferrule and form wedges to assist in holding the ferrule firmly in place when driven onto the end of the stick, both tip and ferrule being thus quickly and firmly secured in position.

MUSTACHE SHAPER.—Paul S. Ferdy, San Francisco, Cal. This is a device adapted to press and hold the mustache firmly against the face, after the mustache has been spread in proper shape, the device thus holding the mustache in position for a desired period of time, or overnight. It consists of a band of flexible material of two layers, between which the mustache ends are received, the layers being united by stitching in the middle, and there being at the ends of the band elastic loops to pass over the ears.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co. for 10 cents each. Please send name of the patentee, title of invention, and date of this paper.

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NEW BOOKS, ETC.

PRACTICAL ICE MAKING AND REFRIGERATING. A plain, common sense series of papers on the construction and operation of ice making and refrigerating plants and machinery By Eugene T. Skinkle. Chicago: H. S. Rich & Company. 1897. Pp. 235. Price, cloth, $1.50; leather, $2.

The present work is a most practical and timely one. Until a short time ago there was absolutely no literature on the subject worthy of the name, but now, thanks very largely to our excellent contemporary Ice and Refrigeration, of Chicago, we have some practical books upon this much neglected subject. This book deals with cooling surfaces and circulation, the construction and piping of brine tanks, the ammonia compressor, oil injection, suggestions to engineers, operating instructions, compressor equipment, ammonia condensers, ice making, distillation of water, etc. There is an appendix containing most valuable tables. The book contains a few illustrations.

RAILWAY TECHNICAL VOCABULARY. French, English and American terms. With 22 tables. By Lucien Serrailier. London: Whittaker & Company. New York: Macmillan & Company. 1897. Pp. 222. Price $3.

This is a most valuable work; railroad terms are comparatively modern; many terms have been coined in each country. Some international nomenclature is needed which will give the technical equivalents of these terms in each language. These considerations have led the author to compile this vocabulary, confining himself to French, English and American terms. He has adopted a method of classification by grouping the terms according to the subject matter. This arrangement is really preferable to the ordinary alphabetical way, as the constituent parts of the appliances can thus be placed under the head of such appliances and synonymous terms can be shown together. The book will prove of the greatest possible value to all who are engaged in railroad work in any important capacity.

STATISTISCHE ZUSAMMENSTELLUNGEN UBER BLEI, KUPFER, ZINK, ZINN, SILBER, NICKEL, UND ALUMINUM. Von der Metallgesellschaft, nebst Technischen Bericht von der Metallurgischen Gesellschaft a. G., Frankfort am Main. 1897. Pp. 78.

THE CHLORINATION PROCESS. By E. B. Wilson, E.M. New York: John Wiley & Sons. Pp. 125. Price $1.50.

The leaching of gold ores by chlorine solutions has proved among the most effective of methods of comparatively recent introduction for enlarging the yield and reducing the cost of modern gold mining, and the process and the kinds of ore where it may be most advantageously employed are now pretty well understood among those who have followed up the literature of the trade on the subject. To a large number interested in the mining business, however, the matter is by no means clear and free from technicalities, and to all such this little book is calculated to prove extremely valuable.

PICTURE RIBBONS. By C. Francis Jenkins. Washington, D. C. Pp. 54. Price $5.

The demand for a more explicit knowledge of the manufacture of picture ribbons for the production of photographic images in rapid sequence, in such a way that they may be reproduced to the eye and thus convey the sense of motion, is the reason for the publication of this work. The old way was to put the images on the face of a revolving disk, which on account of its limited area could not contain as many glimpses of a moving object as is now obtainable by the use of a narrow continuous strip of celluloid, to which is applied the name of picture ribbon. Mr. Jenkins in this book describes in clear language the operation of the machine camera for making the pictures in the first instance, and the subsequent steps afterward, using for illustrations photographic pictures of the apparatus itself, so that any unskilled person familiar with the ordinary process of photography may, by following the directions described, succeed reasonably well in making a series of pictures himself. In the back portion of the book are several formulas for the successful treatment of the film. On one page is a list of the fifty different names by which this style of machine is called, and is of itself a curious feature of the development of ribbon photography. We think the book is likely to be very useful and especially valuable to photographers interested in chrono-photography

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since it gives the latest practical information on that subject.

THE OLD SOUTH OF NEWBURYPORT. Edited by Rev. H. C. Hovey. Boston: Damrell & Upham. Pp. 223.

We acknowledge with pleasure the receipt of a neatly printed and illustrated little volume entitled "The Old South of Newburyport." The book puts into lasting form the addresses of the different speakers at the one hundred and fiftieth aniversary of the founding of this historic edifice. The principal one of these addresses, which deals with the history of the church from its inception and with the causes which led up to its founding, is by the pastor, Rev. Horace C. Hovey, whom readers of this paper will recognize as one of our interesting contributors. Dr. Hovey tells the story in his clear, concise style, and is ably seconded by Rev. A. G. Vermilye, a former pastor. As this church is in the middle of our New England sea coast, in a region where the Pilgrim Fathers settled, and which has since been the home of many of our noblest men, it may be taken as a good example of the founding and growth of a Presbyterian church in America. The book is well illustrated with half tone pictures of the church and pastors, and contains, besides the above mentioned addresses, a complete report of the celebration services, including several poems which were written for the occasion.

SCIENTIFIC AMERICAN BUILDING EDITION

AUGUST, 1897.—(No. 142.)

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No. 1. Two perspective elevations (one in colors) and floor plans of a cottage at Binghamton, N. Y., recently erected at a cost of $3,500 complete. Mr. Elfred Bartoo, architect, Binghamton, N. Y. An attractive design in the English style.

No. 2. A cottage at Scranton, Pa., recently erected for Mr. E. Healy, at a cost of $7,000 complete. Perspective elevation and floor plans. A modern design well treated. Mr. Edward H. Davis, architect, Scranton, Pa.

No. 3. A residence at Prohibition Park, S. I., recently erected for Mr. J. W. Hoban, at a cost of $3,300 complete. Excellent design of modern American style, with Colonial treatment and detail. Mr. John Winans, architect and builder, Prohibition Park, S. I. Two perspective elevations and floor plans.

No. 4. A suburban school house at Overbrook, Pa., designed to resemble a private residence instead of a public building. An exceedingly attractive design. Mr. William L. Price, architect, Philadelphia, Pa. Two perspective elevations and floor plans.

No. 5. Residence at Larchmont, N. Y., recently erected for Mr. Henry A. Van Liew. Pleasing design, with many excellent features. Two perspective elevations and floor plans; also a view of stable, with ground plan. Mr. H. C. Stone, architect, New York City.

No. 6. Cottage at Clinton Township, N. J., recently erected for the Protective Building and Loan Association, at a cost of $1,500 complete. Two perspective elevations and floor plans. Messrs. Hobbs Brothers, architects, Newark, N. J. A neat design.

No. 7. A residence at Larchmont, N. Y., recently erected for Miss Flint. Two perspective elevations and floor plans. The design presents a good, modern, sensible house of pleasing appearance, treated with Colonial detail. Messrs. G. E. Harney and W. S. Purdy, architects, New York.

No. 8. Residence at Prince's Bay, Staten Island, recently erected for A. W. Browne, at an approximate cost of $8,000. A rustic design of much artistic merit. Perspective elevation and floor plan. Mr. F. W. Beall, architect, New York City.

No. 9. Cottage at Forest Hill, N. J., recently completed for Mr. Charles W. Clayton, at a cost of $3,800 complete. An attractive design. Perspective elevation and floor plan. Mr. H. Galloway Teneyck, architect, Newark, N. J.

No. 10. Residence at Evanston, Ill., recently erected for Mr. C. B. Congdon. A substantial and dignified design. Two perspective elevations and floor plans. Messrs. A. M. F. Colton & Son, architects, Chicago, Ill.

No. 11. A pulpit of the Cathedral of Treves. Half page engraving.

No. 12. Washington Monument, Philadelphia. Presented to the city by the State Society of the Cincinnati and unveiled by President McKinley. One of the most important and imposing monuments ever erected in the United States. Cost $250,000. Designed by Mr. Rudolph Siemering, the German sculptor.

No. 13. Miscellaneous Contents: Palais Royal to be demolished.—Largest hotel on earth.—A quick piece of work.—Drawing materials, surveyors' instruments, etc.—Statue of Mercury at the Nashville Exposition, illustrated.—Composboard.—Improved heaters and furnaces, illustrated.—Stair builders' goods.—Architects' and builders' directory.

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Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

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(7185) L. F. writes: I am about to build a compound permanent magnet (built up of plates of sheet steel) 2 inches thick, 1½ inches wide and 3 inches long, and would like to know what kind of steel would be the best for the purpose, the best way to magnetize it, and the best way to age it? Some fellow workmen (of the Chicago Edison Company) of mine and myself are in an argument over these questions and would like to have you settle the same. A. The best tool steel is usually taken for magnets. Its fine and uniform grain adapts it for this use. Magnetize the separate bars before they are finally fastened together and keep them carefully with their poles in the same direction, so that when assembled the parts shall all have their poles similarly directed. A coil of wire and an electric current will magnetize the bars most strongly. The coil should only be large enough to allow the bar to slip easily through it. The coil may have several layers, as the magnetizing power depends on the number of ampere turns, and the current used must of course be such as the coil will carry. The common method is to put the bar into the coil till the center of the coil is at the middle of the bar. Turn on the current, and move the bar to and fro in the coil, stopping finally at the center. Then turn the current off. A large bar would need to be treated longer than a small one. To make the magnetism as permanent as possible, this rule should be followed: Make the magnets glass hard, then place in steam at the boiling point of water, 212°, for 20 to 30 hours, or longer for very massive magnets. Then magnetize as fully as possible, and heat again for five or more hours in steam. Much information regarding permanent magnets is to be found in S. P. Thompson's "Electromagnet," chapter 16, pages 381, 411.

(7186) P. W. C. asks: What material is best suited for making the brushes of a Wimshurst machine? Have heard that tinsel was good, but I don't know what sort of tinsel to use. A. For the brushes of a Wimshurst machine tinsel is the best material, since it is softer than fine brass wire and will not cut away the tinfoil disks so rapidly. Get the best tinsel cord used for military embroidery. It will be well to test it with an electric current to find if it is made of metal. Some tinsel cord does not contain metal enough to conduct electricity. It is made of tinsel paper, and would be worthless for your purpose.

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(Continued on page 110)

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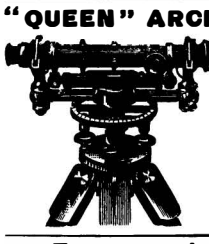

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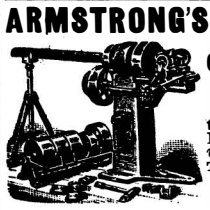

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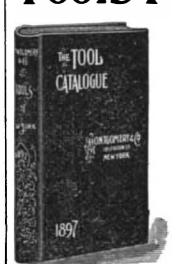

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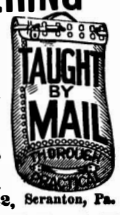

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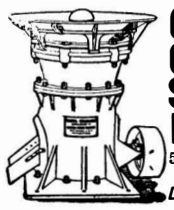

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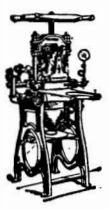

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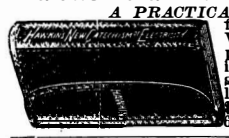

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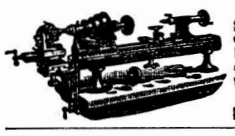

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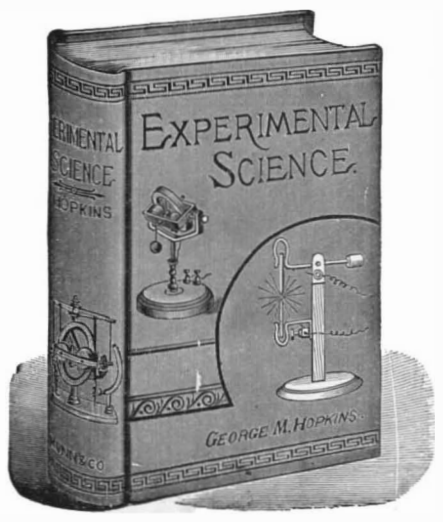

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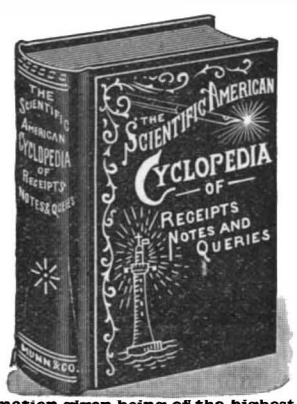

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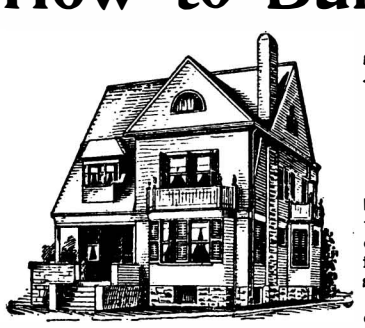

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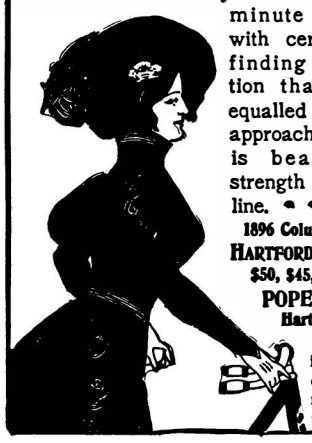

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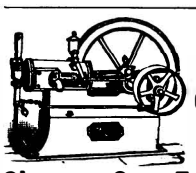

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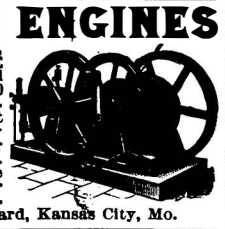

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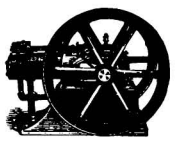

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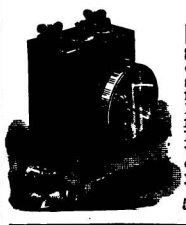

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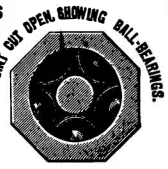

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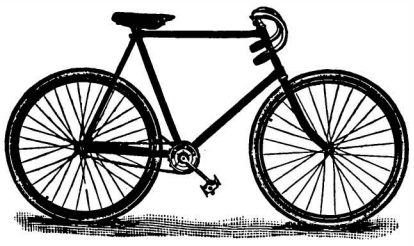

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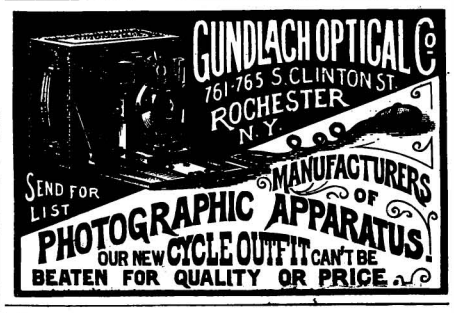

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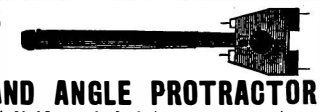

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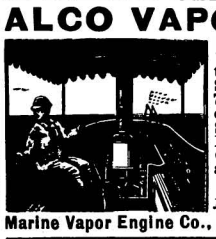

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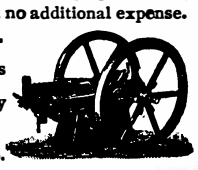

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